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# THE AMERICAN GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

## December Meeting, Guild of Gas Managers.

OFFICE OF THE SECRETARY, Dec. 3, 1897.

The December meeting of the Guild of Gas Managers will be held in Young's Hotel, Boston, Mass., at noon of Saturday, the 11th inst.

A. K. QUINN, Secretary.

## BRIEFLY TOLD.

THE END OF MUNICIPAL CONTROL IN PHILADELPHIA.—Judge Arnold, of Court of Common Pleas No. IV., Philadelphia, before which tribunal was argued the preceedings to prevent the carrying out of the lease of the municipal gas works of that city, for a term of 30 years, to the United Gas Improvement Company, has decided that no injunction in restraint of the execution of the lease may stand. The leasing Company is now in control, and the general impression is that the law is all on the side of the Company. The main points in Judge Arnold's decision, as summed up in the Philadelphia *Ledger* for the 1st inst., are: "The statutes of the Commonwealth of Pennsylvania only confer the power to run the gas works and light the streets of Philadelphia, and do not impose a duty such as the city is forbidden to delegate to other parties. The decision of the city to make a lease to a corporation, and discard the propositions of other bidders, was but an exercise of a discretionary power vested in the municipality, with which the courts cannot interfere. The Philadelphia gas works is not a department of the city government, but is a private enterprise of the municipality, and the lease, therefore, does not delegate such a governmental function to another as is forbidden by law. The lease will not invalidate or impair the contracts of a loan created to procure money for improving the city gas works, because the provisions in that loan for the reservation of certain receipts of the gas works to pay interest and create a sinking fund only amounted to promises by the city, and did not create a legal contract. The court refused to pass upon the question as to whether or not City Councils had a power to enact ordinances which would tend to interfere with or impair the legislative functions of future Councils, the opinion contending that such a question was premature." In our current "Item" columns will be found a letter from "Traveller," which deals further with the delivery of the Philadelphia gas works from municipal control. The complete history of this affair all goes to show that the third city in the United States, after an experience of well over 50 years in the management of its gas works, has decided that such control is neither profitable to the taxpayers nor serviceable to its citizens as a whole, which determination, as a practical example, should and will have more effect in puncturing the wind-filled arguments of the advocates of paternalistic government than anything else or other that may be advanced by those who believe that the underlying and only motive for governments is regulation of the policy of a people rather than their commercial direction.

"X-RAYS ON THE GAS BILL."—The current issue of the JOURNAL contains a compilation, bearing the title, "X-Rays on the Gas Bill," arranged by Mr. James Brackenridge, of New York, which has much to commend it to the owners of gas works properties; not perhaps because the author's sentences contain much that is new to such owners, but rather for the reason that they might find it profitable to put his commonsense presentation of the theme treated before those who are their customers, as well as in front of those whom they would like to secure for customers. As suggested, Mr. Brackenridge's paragraphs and story complete do not add materially to the practical gas maker's fund of knowledge, but in preparing the matter he was guided thereto

by the thought that it could be available to gas companies for free distribution to those who reside in communities, whether large or small, that are supplied with gas. To put it briefly, the author's purpose in the preparation of the article, and our object in its publication, can be set to our joint desire to determine whether a cheap, but serviceable pamphlet edition, for free distribution by gas companies amongst the residents of their districts, would be worth trying. If we receive orders aggregating 50,000 copies—no order to be for fewer than 500 copies—the work of putting the pamphlet in shape will be at once undertaken, the cost per 1,000 to be not in excess of $4. In that figure no profit other than a small royalty per 1,000 for the author is carried, and it is quite certain that such royalty receipt will not over-enrich him. Those companies who favor the scheme should forward their orders without delay to the publishers of the JOURNAL, and the edition will be ready for shipment within a fortnight after the required number of subscriptions is received. It might be added that the author has and does acceptably fill, in one of the New York city gas companies, a position that constantly brings him "in touch" with the fault-finding or discontented consumer.

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NOTES.—Messrs. D. McDonald & Co., of Albany, N. Y., are responsible for the preparation and circulation of as handsomely gotten up a pamphlet as one could desire. The pamphlet is devoted to a description and cataloguing of the Glover prepayment meter. Those concerned in the getting up of the pamphlet, from compiler to printer, have done their work thoroughly and well——As soon as the opinion of Judge Arnold had been received, and Mayor Warwick had formally executed the lease, the United Gas Improvement Company, through its President (Mr. Thomas Dolan), on the evening of November 30th, issued the following announcement: "We beg to announce that, in accordance with the ordinance passed by the City Councils, and approved by the Mayor, we have entered into a lease of the city gas works. In accordance with the provisions of the lease all bills now due the city for gas, or other sales in connection with the gas business, will be collected by us for account of the city. Payments will be due at the several gas offices as in the past. It will be our constant aim to improve the service in every branch of the business and to adopt the most modern methods in our dealings with consumers. Among other things, we propose, as soon as possible, to establish a number of branch offices, where orders can be left, bills paid, the latest improved devices for the utilization of gas examined, and where every customer will be courteously received and welcomed. We expect also to establish a system of transfers, so that any consumer can pay his gas bill, or leave orders at whichever one of the gas offices may be most convenient for him. As soon as the changes above contemplated are put into effect we will advise you, and in the meantime the present offices will be maintained. All complaints as to poor service, caused by excess or lack of pressure, will be given careful and prompt attention. We beg to remind you, however, that it will take time to remedy the principal causes of these troubles, viz., the size and condition of the mains and service pipes. The work necessary to remedy these defects will be vigorously pressed."——Colonel Samuel B. Horne, State Labor Commissioner of Connecticut, in the course of his annual report, gives it as his best opinion that the "municipal ownership of water and gas and electric light plants results in great advantage to the public." Still, Colonel, there is the Philadelphia result.——The proprietors of the Portland (Maine) Gas Company have issued the following amended net schedule of rates—the former net price was $1.25 per 1,000 cubic feet: For consumers whose bills amount to $2,000 or over per annum, $1 per 1,000 cubic feet; between $2,000 and $1,000, $1.05; between $1,000 and $100, $1.12½; between $50 and $100, $1.18½.——Advices by way of Detroit, Mich., dated November 29, are to the effect that a controlling interest in the stock of the Lansing (Mich.) Gas Company has been sold to Mr. B. G. Dawes, of Newark, Ohio.——Judge Perkins, before whom was argued the case of the Covington (Ky.) Gas Light Company against the city (a resume of the argument was given in our last issue) has decided that the city, through its action in 1869, has forfeited its right to take over the Company's plant for operation on municipal account. He decides further that, leaving such forfeiture out of the question, the city has no right whatever to offer for sale its option to purchase the said works, rights, etc.——The Foxboro (Mass.) Foundry and Machine Company, whose buildings were recently destroyed by fire, has determined to rebuild its plant in a substantial and fireproof manner. The main foundry building, which is about 80 feet wide and 140 feet long, is being replaced by a steel frame structure. A traveling crane runway for handling materials in the building is being arranged for, and provision is also being made for suitable jib cranes. The steel framework is being furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Conn.——The gas plant of the Olympia (Wash.) Light and Power Company has been shut down,

[Prepared for the JOURNAL.]

## X-Rays on the Gas Bill.

By MR. JAMES BRACKENRIDGE, New York City.

It is an easy matter to light the gas in these days. The supply is so convenient, the service so regular, and the light has become such a familiar household friend that it is not surprising perhaps if the public be tempted, in accepting the benefit, to become careless and indifferent concerning those who furnish the gas, and even to resent the efforts of its manufacturers to regulate and control its sale.

Gas has become one of those modern conveniences that are accepted as a matter of course, without a thought on the part of the consumer as to the tremendous amount of energy, vigilance and care that is needed for its manufacture and safe delivery to the public.

Every gas company recognizes the fact that its product must be of the highest quality, the service of the very best, and the price the minimum if its business is to be profitable; and every gas company studying its own interests has, for its constant aim, the regular supply of a faultless light to all who are willing to use and pay for it. Nevertheless there is no other legitimate business to-day that is so maligned and misunderstood as is this business of gas manufacture and sale.

The writer believes that if a little more light were thrown on the subject, a great deal of unpleasant controversy and argument between companies and their patrons would be prevented, and a more lenient view be taken by people generally of an important and necessary industry that unostentatiously caters to their needs. Those who are interested in the matter, therefore, are invited to read this presentation of it without prejudice, and perhaps it may cause the consumer to regard with less distrust his next gas bill.

*The Gas Meter.*—Gas is sold by measure, exactly as other fluids are sold; and in some of our cities and states the price is fixed by statute.

In many states, too, the legislature has wisely decreed that the measuring vessel or meter, as it is called, shall be tested and certified to as being correct by a state officer before being placed for a consumer of gas; and, further, that the same officer can be called on to test the meter again whenever a question arises as to its accuracy.

It may be taken for fact, therefore, that all meters are as nearly accurate as it is possible for any mechanical device to be made, and the variation, where there is any, is so trifling as to make little or no difference. There is positively no secret source of power in a gas meter.

The passing of gas through it moves the hands that register, and when no gas passes through, the meter is simply dead material—incapable of motion.

This being so, it is possible for a consumer of gas to draw upon the supply in the pipes of the gas company to the extent of his pleasure. The company places the gas at his disposal and does not attempt to dictate as to how much or how little he shall use, simply insisting that it shall pass through the meter and be paid for. There is no reason whatever why a consumer should not read his own meter weekly or even daily, and keep rigidly within the bounds of his ability or willingness to pay; and it is only necessary to use the same intelligence in buying gas that is used in purchasing other commodities to receive every month a bill that will be paid cheerfully, because it has been personally audited and found correct.

*Errors in Reading the Meter.*—There are occasional errors made, however, giving cause for complaint to the consumer, that, in spite of systems and the greatest possible care, cannot be entirely done away with or avoided. Meter inspectors are not infallible, and clerks are sometimes caught napping.

It is in dealing with this particular branch of the subject that this article may serve a good purpose; and just here it may be stated that the only result of an error in reading the meter is an irregularity in the amounts of two months' bills. In one bill the amount charged is too much, in the other too little; the one balancing and correcting the other, and leaving no resultant overcharge.

The dial of the meter is a simple affair, but so few people take the trouble to study it that there is a general idea to the effect that it is very complex. It consists of hands moving round circles, which register the number of cubic feet of gas consumed in units, tens, hundreds, thousands, etc.

The upper circle registers units, and is only used to detect leaks or for observation purposes; the right hand circle registers hundreds—that is, from 0 to 1—show that 100 cubic feet of gas have passed through the meter, and, of course, a complete revolution of this hand indicates 10 times that quantity, or 1,000 cubic feet. By the time one revolution has been made by this hand, the hand of the center circle stands at 1, show-

ing 1,000 feet, a complete revolution indicating 10,000; shown on the left hand circle by 1, and that in its turn indicating 100,000 cubic feet in a complete revolution.

Now, in reading off the numbers on the circles, we must take the number at which the hand is pointing, or the lower of the two numbers that the hand may happen to be between. If, for example, the hand be anywhere between 5 and 6, on any one of the circles, 5 is to be taken.

Commencing, then, at the left hand circle, the hand is between 1 and 2.

Write down 10,000 for the left hand circle;
2,000 for the middle circle;
300 for the right hand circle;

12,300 cubic feet.

Now, suppose that in taking the index last month the quantity shown was 9,200; then, subtracting this from 12,300 gives 3,100 cubic feet as the consumption for the month.

Let us further suppose, however, that the employee of the company has, in haste or through carelessness, made a mistake in reading the register, and has recorded it as 13,300, and that the bill has been rendered for the difference between that amount and 9,200, or for 4,100 cubic feet. Here we have an error of 1,000 cubic feet, and a consequent overcharge.

A little thought, however, will show that this extra 1,000 feet, being charged this month, cannot be charged again, because 13,300 must be subtracted from the figures recorded at the next reading, and the customer is simply paying in advance.

A mistake of this kind is easily made and easily rectified; it rectifies itself in fact; but it is always a cause of friction between company and consumer, exciting suspicion and distrust in the mind of the latter; and especially so when the error is made in reading the register 1,000 feet low. In this case, the small bill is rendered first 1,000 feet less than it ought to be; and because it is small, is usually paid promptly and without comment; but the inevitable big bill that follows is bitterly denounced and hotly contested.

All modern gas companies have men appointed to examine thoroughly into all complaints, and any irregularity in the bill being reported is at once investigated, and if possible put right.

If consumers of gas would only compare the "previous" index on the current bill with the "present" index of last month's bill, and then compare the "present" index of the current bill with the meter itself, there would be no trouble through errors in reading the meter.

*The Burner.*—Another great trouble is that people do not burn gas intelligently or economically, and when their lack of interest results in the presentation of a larger bill than they are able or willing to pay, the gas company gets the blame.

The burner is necessarily the important point in the economical and profitable use of gas, and the size of the gas bill depends in a great measure upon the condition and form of the burner, and whether the supply of air is sufficient or insufficient to insure the complete combustion of the gas. The burners, therefore, should receive careful attention, and all gas companies recognizing their importance are ready to co-operate with the public in keeping them in good condition.

They are made in all sizes and of various types, but the ordinary burner used for illuminating purposes is supposed to consume about 4 feet of gas per hour, and an excellent light, sufficient for almost any purpose, can be obtained from a burner using that quantity of gas and no more. But such a burner can be made to pass 8 or even 12 feet of gas in an hour, and give less satisfaction than if half the quantity were used; and right here is where so many complaints of high bills have their origin.

The flame at the burner should be even and steady, and can be made so by regulating the supply at the meter until the desired result is obtained at the burner.

People will complain that, although they have cut off two or more lights during the month, the bill is very little, if any, less than for the preceding month, and they simply cannot understand it, when the fact is that the amount of gas supposedly cut off has been forced through the remaining burners. To illustrate: I have eight burners in use during August, each burner passing 4 feet of gas per hour for five hours every evening, and making a daily consumption of 160 feet. My bill for August, therefore, would be 4,800 cubic feet. To economize, I cut off four burners during September, but fail to reduce the force of the supply at the point of entry—the meter—and, consequently, force at least 6 feet of gas through the remaining four burners every hour instead of 4 feet as in August. Hence, my consumption is now 120 feet per day, or 3,600 for September, instead of being 2,400, as I hoped and expected.

The gas company cannot be held responsible for this condition of things, because it cannot be expected to know just what amount of gas is required by each consumer. An effort is made to reduce the pressure, as it is called, when a meter is set, but it is left to the customer to regulate the supply to suit, and a stopcock, simple in its construction as an ordinary water faucet, is placed on the inlet pipe of every meter, for that purpose.

In large cities a high pressure in the mains is an absolute necessity, and the man who carefully turns off the gas at the meter until he gets a sufficient supply to give a steady light, with no unnecessary flare to it, is effectually checking a force that, left to itself, may be the cause of much complaint.

A great variety of gas regulators or governors claiming to accomplish this desired even passage of gas to the burner, is on the market, and they are generally used whenever a large or an uncertain quantity of gas is used, but for the ordinary household or store the stopcock at the meter is sufficient, and has the great advantage that it costs nothing.

*Leaks.*—Now, as to leakage. Almost every consumer of gas has had to complain, or at least has had the impression that his bill has been run up by leakage, either at the meter or the burner, or at some point midway. It was said a moment ago that an ordinary burner passes 4 feet of gas every hour, and if left open for 24 hours would pass about 100 feet of gas; say, 12 cents worth. It is hardly necessary to say more than that such a quantity of gas would cause quite a respectable "leak," and yet make a very slight increase in a gas bill. The truth is, that a leak so small as to be incapable of lighting will create an intensely disagreeable odor, and a leak large enough to make any perceptible increase in a gas bill would most certainly render anyone in its proximity incapable of complaint.

To these facts should be added this one, that a leaky pipe is the fault of the proprietor of the house, and not of the gas company, although the latter will never refuse to investigate any complaint of a leak, and will seldom refuse to remedy the defect.

*No Gas Used, but a Bill Came Just the Same.*—This is a frequent complaint, not always a truthful or justified complaint, but frequent nevertheless. No general explanation can be given respecting cases of this kind, because every case has its peculiar conditions, cause and explanation. Many people have been sincere in their belief, and emphatic in their assertion, that no gas whatever was used during a period of absence from home, when a forgotten burner may possibly have been alight all the time they were away. Now and then a case occurs where, through careless gasfitting, a burner is connected to the meter of a neighboring tenant, and the fact is only discovered when an investigation is made of the complaint of the neighbor. Sometimes the hall light is connected with the tenant's meter, and the fact revealed through the consumption shown during absence from the home.

It is, therefore, a good thing to shut off the gas at the meter when leaving home for any length of time, and you can be sure that, with the cessation of the flow of gas, there can be no register of gas on the meter. notwithstanding the ancient jokes of the comic papers to the contrary.

*Fast Meters.*—Meters are always accurately adjusted when set, and if they are not disturbed will continue accurate for years. But disturbing influences are sometimes brought to bear on the meter, and it may possibly get out of order, more frequently in favor of the consumer, however, than in that of the company. The percentage of variation is very slight, and does not begin to compare with that made in the sale of many other commodities sold by measurement.

But if any user of gas doubts the accuracy of his meter he can demand that the company shall test it and furnish him with a certificate of test. That is his privilege, granted by law. The company may require him to pay the expense if the test proves the meter to be correct or slow. That is *their* privilege, also granted by law. It may be noted here, too, that whereas the gas companies are expected to make good any excessive register of gas, they are not expected by customers to try to collect any under registration.

*Complaints in General.*—No gas bill has ever yet been rendered that, being disputed, was not capable of explanation. The popular impression is that the gas company, by some mysterious process, guesses at the amount each consumer can stand, and charges accordingly.

People hide their gas stoves when the representative of the company is around, and cannot seem to understand that the gas used is being accurately measured, not by a mental process of reasoning, but by a machine as correctly adjusted as the invention of man in this nineteenth century can produce.

Gas meters cost money, and it takes an immense amount of money to maintain them, and the system of registering gas by them; and no

company would be foolish enough to incur all the expense of such a system unless it was a good and equitable one, as fair for consumer as for company.

The only way to satisfy yourself is to take interest enough and time enough to learn the simple method of measuring the gas; take your own index and, by careful, intelligent use of the light, keep the company as your servant, just what it aims to be.

Every gas company in the United States is interested in pleasing and satisfying its consumers, and there is no better way than to have them in a position where they can know from day to day just how much gas they use, can regulate the supply to suit their taste or pocketbook, can, in fact, make their own gas bill, and simply deal with the company as they deal with their grocer or any other caterer to their wants.

Just a word to you who have occasion to complain of abrupt treatment from employees or officials of gas companies. As a rule the officers in charge are courteous and polite. They have, at any rate, a certain amount of good sense, by virtue of which they occupy their positions, and they very well know that as no company can afford to ignore its patrons or treat them in an arbitrary manner, they, therefore, would not long retain their position if found to be otherwise than attentive and courteous to the customers of the company.

At the same time, it should be remembered that the working staff of any corporation is composed of men who are mortal and who are probably as sensitive to any imputation touching their personal honssty and integrity as the complainant can possibly be, and just as quick to resent any such imputation.

Your complaint is probably one of a great many similar ones received, and cannot be expected to impress the clerk or manager as it does you. He may appear to treat your grievance in an offhand way, but his experience has enabled him to grasp the entire subject before you are half way through your narrative; the details coincide with those of many former cases, and his time is valuable; so there is a great deal to excuse his apparent indifference. But you may be sure that your complaint, if made brief and to the point, will receive just as much attention as if it were embellished with all the dramatic fire and eloquence you can command, and lengthened out to the full limit of your powers.

No employee of the gas company has any personal interest in the size of your gas bill.

The man who reads the index of the meter does not profit by the amount registered, but is paid to record accurately the gas used, and his position is endangered every time he makes an error.

The clerk who enters the recorded index in the ledgers, and charges your account with the amount consumed, is not concerned as to whether he makes your bill out for 50 cents or $50; nor is the collector engaged to do any more than collect the bill handed to him; and when we repeat that the gas is registered by a meter manufactured, not by the gas company, but by independent concerns, and tested by officials appointed by the State, there remains no possible way in which the company could be otherwise than square and fair in its dealings with the people.

Indeed it is scarcely necessary to give this statement publicity, certainly not for the benefit of anyone who takes time to give the subject intelligent thought; yet there are hundreds of people who firmly believe that each gas company is organized to get the best of everyone who has dealings with it, and who carry their belief to the extent of justifying themselves in getting the best of the company wherever they can.

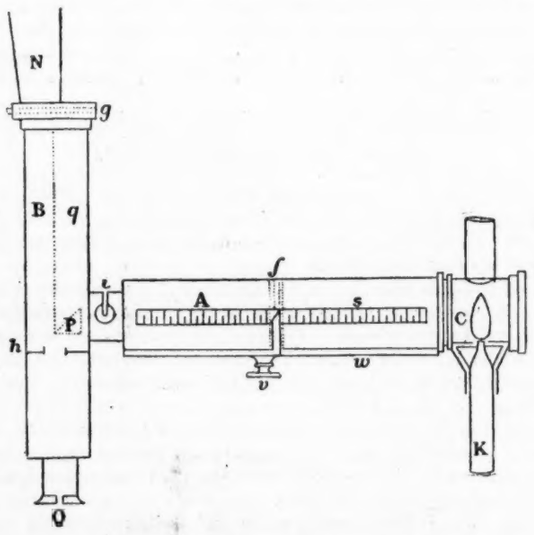
For such people, and indeed for all consumers of gas, this compilation is published, and while it does not profess to cover the entire subject, and cannot claim any literary merit in its makeup, yet it is given in the hope that it may induce the public to regard gas companies in a somewhat different light, to take a more intelligent interest in their use of gas, and, when the bill comes in, to pay it readily and cheerfully.

[Translated for the JOURNAL by Mr. Herman Poole.]

## The Weber Photometer.

*Revue Industrielle* notes that the Weber photometer, so much used in Germany, serves to measure the illumination of surfaces (that is to say, the intensity of the diffused light reflected by these surfaces), by means of comparison with the same effect produced by the unit of light placed perpendicularly at a distance of one meter. It may also be employed as a measure for the sources of light.

In the accompanying cut *A* is a tube, blackened inside, and half a meter (19⅝ inches) long and 0,08 meter (3,15 inches) diameter. A box *C*, placed at one end, receives a paraffine candle *K*, used for comparison. There is a scale for regulating the height of the flame by moving the candle. A frame *f*, moved by the screw *v*, attached to the support *w*,




is placed in the inside; this carries an index showing on the scale *s*, the distance *r*, between the opal glass plate of the frame *f* and the flame of the candle *K*.

A second tube *B*, movable in all directions, is placed at right angles to the other at the other extremity, to which it is fixed by a spring catch in the slit *i*. This second tube is generally in a horizontal position, although represented in the figure as vertical, so as to better show the interior. For vertical measures a reflecting prism must be arranged before the ocular opening *O*.

In the interior of *B* is a prism *P*, by which the observer at *O* can see the opal glass plate of the frame *f*, illuminated by the flame of *K*; he sees it only on the left half of the field of vision comprised between the diaphragm *h* and the right half of the prism. In the right half of this field he sees the opal glass plate of the frame *g*, and in some especial cases a white surface placed immediately before the apparatus. The tube *B* has a false vertical wall *q*, extending from the plate *g* to the prism *P*, to shut off all light which might reach *g* in the prism. A shade cone *N*, placed before *g*, prevents all extraneous light from reaching the plate.

According to the Schilling Brothers the apparatus is used as follows: Point the tube *B* to the surface whose illumination is to be measured, and which is placed at any desired distance from *g*. Then introduce, by the prism *P*, an equal quantity of light by moving the slide *f*. Read the distance *r* and the flame length *l*, put at the beginning at 0.02 meter (0.79 inch.)

The illumination, *H*, of the surface tested is calculated from the distance *r* and the height of the flame, by means of the formula—

$$H = C\frac{\lambda l}{r^2}\,10{,}000.$$

*C* is a constant coefficient, determined by placing a normal flame or other source of light measured perpendicularly, at a distance of 1 meter from a white surface towards which the photometer is directed.

$\lambda$ is a correction factor for the length *l* of the candle; this factor is equal to 1 when $l = 0.02$ meter, and the result should be increased or diminished by 1 per cent. for every difference of 0.01 meter more or less. We have, then, reading *l* and *r*—

$$C\frac{\lambda l}{r^2}\,10{,}000 = 1,$$

$$\text{then } C = \frac{r^2}{\lambda l}\,10{,}000.$$

To determine the intensity of a luminous source with this apparatus, place it directly before the tube *B*. Account must be taken of the distance *R* between the focus of the source and the plate of opal glass *g*. The illuminating power of the source *J* is obtained by means of the formula—

$$J = C\frac{R^2}{r^2}\,\lambda l,$$

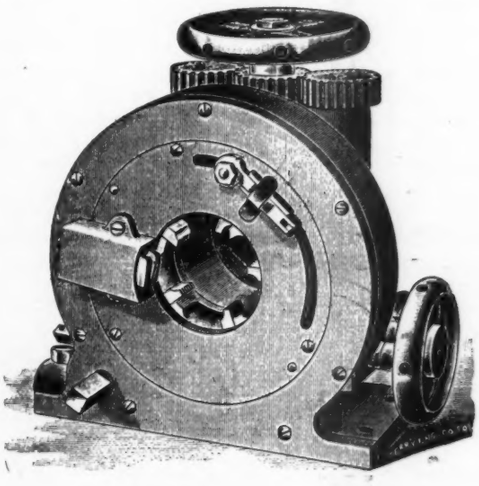
*C* being determined by substituting for the light tested a unit of known

light. If the intensity to be measured is too great for the apparatus, reducing glasses are used, placed in *g*, and whose power has been previously determined.

## The Columbus Portable Hand Pipe Threading and Cutting Machine.

The portable hand pipe threading and cutting machines built by the Columbus Machine Company, of Columbus, Ohio, have positive quick opening and closing dies, combined universal automatic or hand feed, automatically gauged cutting off knife and geared self centering vise. The frame is integral, and within it the gearing, die head and vise are journaled in perfect alignment. Power is applied by ratchet lever or extensible crank, or by the simultaneous use of two cranks, the side crank being an important feature for cutting off. Worm gear engagement of the die head with a frictionally retained hand wheel shaft gives universal automatic feed or rack and pinion movement at will.

In operation the pipe is held stationary, the die head traversing the space to be threaded. The chasers have cam movement controlled by knee joint lever adjustably secured to permit of graduation to size, and by which the chasers can be instantly opened and positively closed. Five chasers are used to a set, which insures truer threads than sets of



less number. They are readily interchangeable and can be resharpened by grinding. The machine illustrated is made in three sizes: No. 2 has two sets of chasers for threading pipe from 1 to 4 inches; No. 3 has three sets of chasers, for threading pipe from 1 to 6 inches, and No. 4 has three sets of chasers, for threading pipe from 2½ to 8 inches.

## Retort Setting and Retort Heating.

[A paper read before the Southern District Association of Gas Engineers and Managers, by Mr. C. C. CARPENTER.]

The day is probably not far distant when the direct firing of gas retorts will have been wholly abandoned, except in the very smallest of works. Gaseous firing is so easy of application under a variety of conditions, and the principles governing this are so easy of mastery that it becomes a matter of surprise that progress in this direction has not been even more complete. Success depends upon, and is the result of, the avoidance of certain evils inseparable from direct firing; and it may be profitable, therefore, to give some little consideration to these by way of introduction.

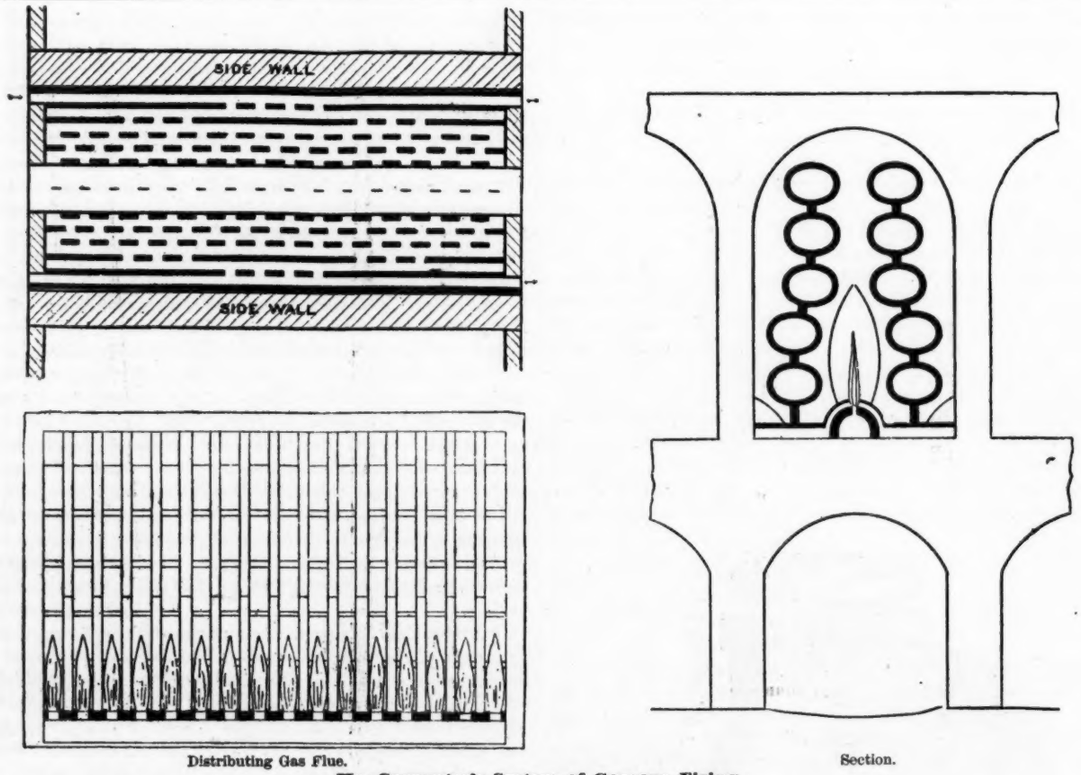
From the point of view of regularity and evenness in heating the retorts there was less reason for dissatisfaction when these were 6 feet long, and set three in a bench. In this case the heat-giving area of the fuel bed was large in proportion to the heat-absorbing area of the retorts. As the necessity arose for increased retort house production more retorts and longer ones were placed within the setting. The furnace capacity was not, however, increased in the same degree; and not only this, but its relative position with regard to the retort surface underwent a considerable change. The usual arrangement of the furnace and flues of a Cornish boiler affords a very good example of the changed conditions. But the distillation of coal requires a far higher temperature than that of water, so to make the Cornish boiler type of setting available for retort heating, the draught and temperature of the furnace had to be largely increased. This necessitated providing a large amount of shielding to the retorts in juxtaposition to the furnace, whereby their thickness was doubled or trebled. The addition of this mass of brickwork could not fail to be uneconomical from the fuel point of view. The double-chambered settings of Cathels are probably the best-known of the many arrangements devised to remedy this want of economy. As regards fuel consumption, they were an undoubted advance in economy; but, with equal depths of coal in the retorts, the temperature at which it was carbonized varied considerably from front to back—being highest about the furnace, lower in the next chamber, and still lower in the outlet or exit one.

This brief sketch of some of the defects in direct firing has been given to make clear the main reasons why such a system is incompatible with the uniform and regular heating of the retorts, quite apart from what may be called the chemical advantages of a regulated supply of secondary air for combustion. That is to say, with such an arrangement of setting the substitution for the ordinary furnace of a gas producer having controlled admission of primary and secondary air will not carry any farther forward the endeavor to obtain even and regular heating. It is somewhat remarkable how the earlier designers of gas fired retort settings overlooked this point, and the facilities for regularity in heating with an entire absence of zones of high and low temperatures, obtainable by an equal distribution of producer gas throughout the entire setting. Gaseous firing *per se* was certainly a step in the wrong direction when gas from a producer was laid on, so to speak, to an ordinary setting.

If the problem were given to any gas engineer to convert into steam, by means of coal gas, the water contained in a horizontal pipe, let us say 20 feet in length and 15 inches in diameter, he would, in all probability, solve it by running underneath and throughout its length a gas pipe perforated with jets from end to end. A step in the right direction was made when producer gas was so distributed throughout the length of a retort setting. Many engineers have reverted to this, the so-called blowpipe system, after trying the open topped producer. Some causes of partial failure have, however, to be guarded against. In order to economize space and heat the practice was followed of placing the producer directly beneath the jet-pierced distributing gas tube, which formed, indeed, the furnace crown. The calorific value of the gas rising from the producer was not uniform, varying from two causes—its composition and its temperature, or sensible heat. In experiments made with the Klönne furnace some years ago, a difference of from 5 to 6 per cent. of combustible gas was found in samples taken respectively from the front and back of the fuel bed. The variation in the sensible heat was visibly apparent on looking into the furnace. To take an extreme case, producer gas made from coke is hardly ignitible at ordinary temperatures, and is kept alight with considerable difficulty. To obtain regular distribution of heating effect throughout the setting nostrils, it is not only necessary, therefore, that these should be of equal size throughout, but that the gas they have to distribute should be of one composition and temperature. This result can only be attained by passing the whole of the gas evolved from the producer through a port of sufficient area to cause thorough and effective commingling before distribution by the nostrils.

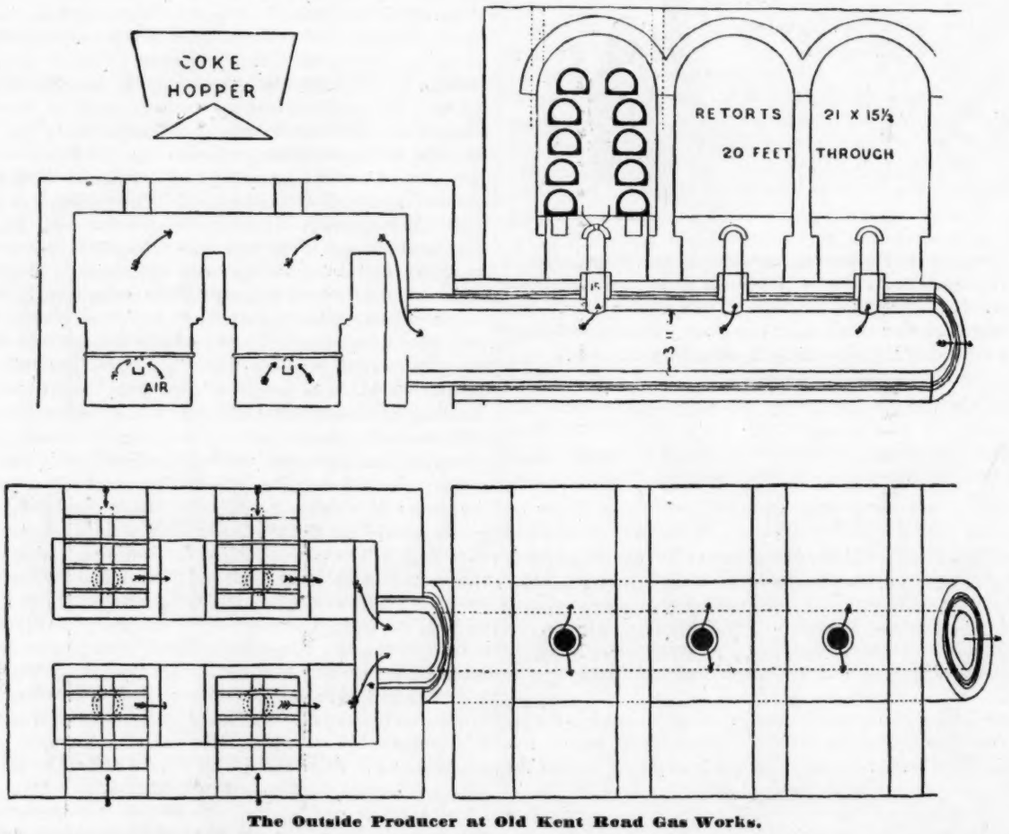
Having thus dealt with the supply of uniformly constituted gas from end to end of the setting, attention may now be given to considering the means of admitting air for its proper combustion. A convenient length for the gas nostrils is 6 inches, and if these are made 1½-inches wide they will be of suitable size for heating a setting of 6 retorts, when spaced out in the way described later. From these nostrils the gas issues in the form of a flat jet (rising when cold to a height of about 30 inches), and is supplied with air by similarly flat jets impinging against it on either side. The object of this arrangement is to split up the issuing gas into the thinnest layers practicable, and to envelop each with an adjusted supply of hot air. It is of not less importance than in the case of the gas that this shall be regularly heated and distributed—its composition, of course, is constant. A simple manner of doing this is shown. Four and a-half inches above the floor proper of the setting is formed what may be called a false bottom. Cold air is admitted to the space between this double bottom through a regulated slide in each of the four corners; and, by means of the baffles, its course is split up and divided until, duly heated, it passes out from the ports or slots and impinges against the gas jets as described.

A legion of other plans for heating up and distributing this secondary air have been made the subject of patents. The one described has the merit of extreme simplicity, and is one from which any chances of short-circuiting or failure are eliminated. It is economical by reason of the flue acting as an air jacket to the whole of the floor of the setting.




Distributing Gas Flue. Section.

**Mr. Carpenter's System of Gaseous Firing.**




**The Outside Producer at Old Kent Road Gas Works.**

With such an arrangement as that described any desired heats can be maintained—and that, too, with the greatest regularity. From the gas and air nostrils, the products of combustion rise vertically and equally to the crown of the setting arch, where they divide and pass downwards on either side. At the bottom flue they are collected, and can be carried thence either up or down, as the main flue is above or below the settings. The most suitable number of retorts to place in each arch varies with circumstances. The setting of six is a good one, and is little impaired by the addition of a seventh to the top row. The so-called bull's eye should certainly be avoided. For large, or even medium sized, works two vertical tiers of four or five in a setting are, without doubt, the most economical in construction and working. With machinery, the extra height involved is little or no disadvantage; and with a properly arranged coal bin, this statement applies with equal force to hand charging.

The much discussed question of the proper section for retorts must

not be overlooked. For hand or machine work, the writer gives the preference to the so-called oval or ellipse. Retorts of this section are stronger than Ωs, and have no weak corners to require thickening up with protective shielding. They are easier to draw, either with hand or machine rakes, since the coke falls naturally to the center or path of the rake bar. With a section 21 inches by 15-inches, and 20 feet in length, it is easy to obtain in ordinary working, 7,000 cubic feet per mouthpiece, with Newcastle coal, in four charges per 24 hours. Set as described, their average working life is from 1,800 to 2,000 working days. For sloping retorts, the Ω form, more or less modified, but having a flat bottom for the coke to slide out, is no doubt correct.

In designing retort settings, the number of the cross walls should be increased and their thickness reduced as much as practicable. Only the front wall should be 9 inches in thickness. The internal walls should not exceed 4½ inches except at the joints, where they may be increased to 6 inches. The space between the walls—the unsupported span of the retorts—should not be greater than 9 inches. Settings of five retorts high, set as described, show no signs of settlement in the center after four seasons' working. Not only in thickness, but in elevation, too, the cross walls should be built with a minimum of brickwork—that is to say, arches should be turned as close to the retorts as possible, while leaving room for "pinning up." Care should also be taken that these cross walls completely encircle the retorts—that is to say, their girth, multiplied by 9 inches, should be the maximum unprotected surface. For this reason, it is better to support the flue side of the "bottoms" by a flat arch turned from the floor to the side wall, instead of the corbels frequently used to gain flue space. The cross walls may be carried right up to the soffit of the arch; and this gives strength to the setting as a whole. For the internal flat arches forming the combustion chamber nothing is better than the Ewell bricks. With them the chamber can be reduced to a minimum, as there is no contraction in the material under high temperatures. For the weight-bearing walls of the bench, and at least the lower ring of the main arches, Scotch bricks will be found decidedly superior to Stourbridge or Newcastle. They are much better burned, and do not, in consequence, contract when exposed to high heats. This quality is of great importance, both with the side walls and the arches. The function of the lower ring of the latter should be that of a self-supporting, heat resisting shield to the other superimposed rings, on which the weight above should be carried. If the side walls shorten during their life the arches become more or less distorted, and in many cases room is too cramped above the "quarters" of the top retorts.

Attention must now be given to the producer which is to supply the combustible gas for heating the settings. Its cross section is not very material, and, though the circular form is probably the best, yet, under certain limitations of space, it may be made either square or rectangular in plan, as may be necessary to obtain the required grate area. For gasifying the coke from Newcastle coal, this should not be less than ¼ square foot per mouthpiece, the whole of the grate surface being included in the calculation. The hearth type is less suitable than a grate with firebars, except in the case of small producers supplying single settings. Below the clinkering frame, the dead plate may be conveniently arranged so as to dip into the water of the pan. By this device, excessive air supply will only gain access to the grate while the doors are open for clinkering—the ashes being removed through the sealed outlet of the pan, as may be convenient. It is very desirable that the quantity of fuel above the bars should be maintained at a constant height; and this is attained by dividing the upper part of the producer, by means of a curtain wall, into a hopper space from which the fuel may run out as the lower portions are consumed. The hopper when thus arranged inside the producer, gives time for heating up the fresh charge of fuel (when this is used cold) before it is supplied to the active zone of the producer. It is unnecessary to state that no air should gain access to the fuel bed, except through the controlling slides.

Tar makes a very good coating for the external brickwork, but a sheet iron casing would be better, though more expensive. The primary air, after passing through the regulating slides, is admitted below the bars under the cast iron plates forming the base of the furnace cheeks. These are thus kept cool, and the clinkers more readily detached. Clinkering is performed by driving in false bars to carry the the fuel when the bottom ones are withdrawn and the clinkers fall into the pan. A gas-tight opening at the top is provided for the admission of fresh fuel. From what has been stated, it may be considered that the simplicity gained for the system of heating retorts by fuel gas applies equally to its production.

There remains to be discussed the position of the producer with regard to the setting. At the outset, it was usual to place it wholly beneath the setting. Partly on account of bad heating of the retorts at the fire-door end, and partly to facilitate feeding with hot coke, it was gradually brought forward until it projected well beyond the retort face. For the convenience of charging the advantage of this position is undoubted. But apart from this, the whole system of combining in construction the producer gas apparatus and the retort settings where it is burnt, cannot be accepted as the solution of the problem of gaseous firing. The production of heating gas should be separate and distinct. From the producing source the gas should be conducted to the settings, and admitted thereto through suitable valves in the exact quantity required to maintan the desired temperature. The quality of the gas would thus be more constant, and heat regulated with a greater degree of exactitude than is possible when each setting has one or two producers. All the advantages of gaseous firing would be obtained in many floor houses, when it is impossible or too costly to construct furnace vaults; and in the case of storage houses, the vaults would revert to the original purpose for which they were constructed when these were first designed—the storage and handling of coke. In its passage from the producers to the settings, a considerable portion of the sensible heat of the gas would be lost; and the precaution would have to be taken, in lighting up each setting, of arranging for the ignition of the more or less cool gas before the setting was hot enough to make this a certainty.

Where additions or reductions in the number of the settings under fire have to be made singly, the main gas flue and valves should be placed preferably beneath the charging floor, so as to insure complete isolation for any settings out of action or let down for repairs. When a considerable range of settings are simultaneously put into or out of action with their common producer, such precaution would be unnecessary; and the gas flue in this case would be properly placed below the settings.

The system of retort heating advocated has now passed the experimental stage. Mr. Frank Livesey, the Chief Engineer of the South Metropolitan Gas Company, has designed and erected at the Old Kent Road Works several installations of the type described. In the latest plant, two producers, placed one at each end of, and outside the retort house, supply with heating gas the entire bench of 300 mouthpieces. He has very kindly promised to describe this important innovation in in carbonizing apparatus.

In conclusion may be stated the main points around which this paper has been written:

(1) That the method of heating retorts by the supply and even distribution of fuel gas has the recommendation of almost ideal simplicity.
(2) That the construction of producers for supplying the necessary gas is not less simple.
(3) That the problem of retort heating promises favorable solution on the lines of (*a*) the production at convenient centers of heating gas, and (*b*) its delivery as required into the various settings, where (*c*) it may be burned economically and regularly.

## Re-inspection of Electrical Fire Risks.

By Mr. J. E. Talbot, in *Electrical World.*

It is an undoubed fact that the electric current, when properly installed, affords the safest means known at present for illumination, but it is also true that such an installation, if carried out with parsimonious ideas in the ascendant, is a source of danger, and to a greater or less degree threatens a conflagration at all times.

In the present condition of the art this statement is a truism, and only reiterates what is perfectly well known.

It might also be supposed that with the supervision now exercised by various authorities over the work of installation, that defective wiring or appliances could hardly be found to-day.

Construction work is most certainly much better, as a rule, in 1897 than it was in 1887, though no rules and no inspection can entirely eliminate the dangers due to cheap work. It is not, however, to the class of work done at the present day to which I would call attention, but rather to old work, which may or may not have been passed by an inspector, and to alterations and additions which in many cases have never been passed by anyone, except as their dangers have been passed unnoticed or unheeded. So long as no actual trouble arises the average owner of property is very apt to suppose that everything is all right, and to pooh-pooh any suggestion that money should be spent on the ground of safety.

Nevertheless, every electric light man is continually meeting cases where the conditions, if not absolutely dangerous for the moment, are

liable to become so on the least provocation. A nail carelessly driven, or even the upsetting of a pail of water or a bit of leaky plumbing, might cause a loss of thousands of dollars. Instances of this will occur to everyone of us, so one example will suffice. Within the past few weeks the writer happened to be on the stage of a well-known theater in an Eastern city, where, instead of a switchboard, of slate or marble, constructed with a view to safety, there was a beggarly assortment of switches of various kinds, wires running hither and thither, and rags of perished tape dangling about, the whole attached to a wooden partition at the back of the boxes. The circuits were overloaded, and the whole thing dangerous. In another case of old work, also in a theater, in the West—anything but a fireproof structure—wired with "undertaker's" wire, joints were found with no solder, of course, the two ends of the wire just hooked together, and apparently only kept in contact by the tape wrapping.

Now, without being an alarmist, no one can regard conditions such as these without considerable apprehension. In the event of trouble occurring, not only is there the particular case of damage to be considered, but also the moral effect on the public mind. The public is ready enough to accept the dictum of some irresponsible reporter that "the fire was caused by electric wires"—even in cases where there may have been no current in the building at all. Where defective work causes injury, the virtuous suffer more than the guilty, and the whole electrical business feels it.

I am not claiming that anyone is responsible for work remaining in a condition which is dangerous, or which may readily become so. It is suggested, however, that some authority should be made responsible, being supported by due legal process.

The Commissioner of Wires for Boston, in connection with this subject, says in his last report: "There are miles of wire concealed from view that were installed before the creation of this department, the insulation and method of installing of which would not have received its approval, and the inroads of time on such installations will gradually cause them to become an element of danger. For this reason fires due to the transmission of electricity must be expected in the future, which this department is powerless to prevent."

In view of the existing state of affairs, it would seem not unreasonable to have all electric installations subject to re-inspection under the law, at stated periods, for the public protection; or, if this seemed too harsh a measnre, let the compulsory revision be confined to public places, such as theaters, halls, large office buildings, churches, and the like, leaving the insurance companies to protect their own interests by refusing to renew policies unless suitable changes are made.

It is unnecessary to say that the insurance companies are unwilling to lose business through an excessive scrupulousness in such risks, and frequently the agent renewing the policy has not sufficient technical knowledge to judge what conditions are dangerous and what are not. Should the insurance interests insist on a proper re-inspection of all electrical risks from time to time, still tact and discrimination could be employed with advantage in deciding in which cases radical alterations or reconstruction must be required to avoid imminent danger.

It is suggested also that the insurance companies, by making a liberal reduction on their rates for electric lighting executed in a first-class manner, would stimulate owners to pay for good work. Statistics will show the relative fire danger of the electric light as compared with gas, oil or candles, with their necessary adjuncts—matches.

Owners of property are by nature averse to spending money, but a little judicious pressure from insurance interests would at least render them willing to approximate in their electric equipment the standard they recognize with regard to gas, water and plumbing. For present and future work the ever-improving standard of construction may be relied on.

In the case of places of public resort, where a panic would be disastrous, the rules can hardly be too stringent, and it is believed that no one would welcome these more heartily than the electrical fraternity.

## Plaster Casts and Other Methods of Holding Shell Forms.

[A paper read by MR. JOHN C. KNOEPPEL, before the Western Foundrymen's Association.)

The art of constructing plaster casts for the purpose of taking off patterns in metal belongs more to the pattern maker than to the foundryman. The molder is not expected to learn this branch of the trade, as it is not universally practiced and probably not understood by many engaged in foundry work, being more in the line of pattern work.

This form of pattern making is very simple and inexpensive, yet very precise and accurate, especially so on irregular work, as patterns that require backing out, such as for deep figured, carved and ornamental designs. To properly back out a pattern so as to make it the required thickness and at the same time produce an even pattern requires great care and tedious labor. We all know that to make patterns for shell forms of any size or shape requires much time and in many cases untrue or uneven patterns are the result, when built of lumber, causing considerable trouble to the foundryman in using the same in sand on account of their being warped and out of shape.

In making patterns in plaster we first have the outer form made of wood in a block shape. Sometimes this outer part is made of plaster by the aid of suitable sweeps and having such ornamentations and figures thereon as are called for by the designer. When the pattern is completed, have a true board made with battens on and tongued on to the end to keep it from warping. Fasten the block to it with screws from the under side, varnish the same and allow it to dry. Then have a flask made for the purpose with an extra nowel part, properly fitted with pins and eyes alike and to suit pattern board.

We are now ready for the plaster cast. Put the pattern board on a bed of sand, fitting the extra nowel to it, and clamp the same. Before pouring in the plaster oil well the pattern and board, olive oil being preferable. Now mix the plaster of paris with water sufficient to give it the consistency of thin mortar, so that it will find its own way to all parts of the pattern, and of sufficient quantity to fill the nowel, allowing it a short time to settle, then strike off and put on a bottom board and secure with screws. Mixing a little parting sand with the plaster hardens it, and it will dry quicker and have less blowholes and bubbles. After a lapse of 15 or 20 minutes roll over the plaster cast and unscrew the pattern from the board, taking off the board, the pattern proper still remaining in the plaster. Rap carefully and draw it out of the plaster. You now have an impression the reverse of your pattern. While the plaster is drying take the block pattern and put it back to its original position, being careful to clean it well before using it for molding from it. At this point you have concave and convex form of pattern. The plaster cast should be allowed to dry for at least 15 hours, but could be dried in less time with moderate heat.

We are now ready for filling up the thickness in the plaster cast. Have a true board made, with strips of the required thickness fastened to it at each end. This board should be about the size of a kneading board, such as is used in our homes. Mix up a composition of whiting and melted beeswax to the consistency of stiff dough and with a rolling pin roll out suitable sheets, cutting them into different sizes to suit the work, laying and pressing them carefully in and against the surface part of the cast, using suitable tools, the hands and fingers coming into play frequently. Secure the filling with tacks.

This filling or thickness composition should be put only where the pattern line shows; all of it should be well varnished, and when sufficiently dry proceed to mold.

Take the bottom board and pattern, place the nowel for the purpose upon it, being careful that there is no shift, and fit into the pins on board tight; ram this up with sand in the usual way, treating the mold as you would in every case, clamping the same as in the case of pattern making or molding. Roll over on the bed and unscrew the pattern from board, taking it off; draw out the pattern proper and finish in the usual way; then proceed to the cope part. Take the plaster cast and place the cope on it, using the same precautions as with the pattern. Provide suitable gates for pouring and ram this part up with sand also. Roll over, being very careful not to disturb the mold in drawing the cast off the cope. Finish as usual.

We now have nowel and cope part. Close these two parts together, marking the gating points with flour; take off the cope again, cut the gates, reclose flush and clamp up. When you are ready for the metal, before closing for the last time, be sure that the parting line meets. A little flour will help to fill it up if a little slack, thus producing an economical as well as a very true and reliable mold. Sometimes a right and left form are necessary, such as for heads, birds animals and statuary, to produce a full form. In that case both sides are made in the manner described above.

While at work some years ago in one of the Western foundries a large number of these patterns were broken and patched so much that they made heavy as well as unsightly castings. The original could not be had, and of course could not be duplicated. I then suggested plaster casts and the work was given me. Using the regular patterns to work from, the first cast was reduced about 10 pounds over the old one. The result being satisfactory, I was given more to make up, due allowance being made for shrinkage.

A large variety of subjects can be made in plaster, and when once

acquainted with this branch many lines can be pursued for plumbers' work, tees, elbows, branch pipes, hoppers, etc. These casts can be preserved for future use, or a number of master patterns may be taken off and stored.

Another good way to take off block patterns is by stripping. While it is not as accurate and precise as the plaster cast, yet it will answer in many cases. The plan is similar to that mentioned, but instead of plaster we work the block directly with sand. The block is made and secured to a true board, as in the case of plaster casts. A cope is fitted to it, and rammed very hard with common sand and rolled over. The board is taken off and the pattern drawn out. Suitable wooden strips are cut to conform to the work and of the required thickness. Now have sufficient paper on hand, cutting the same into suitable strips, and lay it on the surface of the mold and nail the paper to the sand until the required thickness is obtained. Then commence laying on the wooden strips, these being cut large or small as required. After all is filled up even with the joint, fill in with fine sand. This might be done while laying in the wooden strips to keep them from falling out of place, being careful not to disturb any part of the mold. Then place the nowel upon the cope and ram up in the usual manner, roll over care fully and take off cope. The cope is what we term a false coping, and is shaken out. After cleaning off the pattern prepare the cope in the usual way. Put it on the pattern board with block fastened thereon, clamping and setting the gate pins and ramming up with sand. This needs to be treated differently from the first case, not ramming too hard, and in the regular way, as in the course of molding. Roll over, take off the board, and draw out the pattern. Now finish both parts, nowel and cope. When completed close cope on the nowel, put a little flour on the joint with a bag, lift off and see if joints touch and meet and join securely ; see if you have even thickness ; then close again and the mold is ready for pouring.

Almost any form of work can be made in this manner, of a smooth character, such as kettles, pipes, drum tanks, bathtubs, etc.

Still another simple way is to make a core the desired shape with a sweep, drying it, and then with the thickness strips lay on the core and ram up.

A few years ago I made a steam receiver with reducing end and flanges, 30 inches in diameter, 10 feet long, reducing end being about 20 inches, weighing about 5,000 pounds. The party wanted only one casting, and it would not pay to go to the expense of making a pattern. I proceeded as follows : Sweeps were made to conform to the shape at each end and at the center. A skeleton frame was also made and was laid on core plates made in halves and dried, with proper core irons, having suitable holes drilled and threaded to handle them in lifting. I placed one half on mold board, placing the flanges at each end, and having the thickness strips ready to lay on the core and and rammed up in the usual way with sand ; rolled over and made joint. Put on the other half core, and stripped it as in the nowel, being careful that they corresponded with each other. Put on the cope and set the gate pins and rammed up. After lifting off we took out the cores and returned them to oven for redrying, finished the mold, setting chaplets and resetting cores, said cores providing their own prints. This was cast in green sand and turned out very good.

*Discussion.*

C. A. Sercomb—The writer does not refer to the expansion or contraction of the plaster after forming the mold. Information as to the expansion or contraction would be valuable.

A. Baer—There would be a shrinkage if anything. If you had to nail it on the board before pouring it would shrink away from the frame and drop.

J. Ott—I have never had any experience in making ornamental patterns, but I have made a great many casts of plaster of paris. The only time that I ever found plaster of paris expanded was when we put the wood into the sand. I would suggest the use of emery dust instead of sand. It causes the plaster cast to harden so that you can hardly cut it with a chisel or knife. I have made light plaster of paris patterns, but I have never paid much attention to the expansion or contraction.

W. Ferguson—Although I am not very familiar with reversing, or making patterns as described, the principle is applied in all foundries—in all classes of molding, green sand molding, dry sand molding and loam molding—in getting the one side of the pattern. Suppose you are making a stove door, you make the bottom part of the mold and get the drop from it. The same thing is applied in making a kettle exactly. Sweep up the outside and inside the full size and then take off the thickness. It is the same principle. So it is true in making pipe of all kinds. That is another application of the same principle. I think you will find it in regular practice anywhere.

W. L. Thompson—I can see where the putting on of this strip can be of considerable advantage in ornamental work or in the making of core boxes. But in making a pipe or receiver the ordinary way of sweeping up from a spindle with bearings at each end would be a cheaper way of making the casting. This material is expensive. I do not see there is any advantage gained by using any material for putting on the thickness, for where the outside diameter is swept up first and the cope rimmed on that and then the thickness put on the sweep and the sweep put in the mold after the cope has been taken out, and the thickness swept up that way, it is plainer and cheaper and we can apply it to everything but ornamental work.

A. Baer—As I understand it, this method is used principally on ornamental work. In pipe or kettle work you can sweep readily in green sand, and it is much easier than plaster of paris, by having a double sweep.

## Defects in Electrical Specialty Designing.

By Mr. H. N. Gardner, in *Electrical World*.

What is more provoking to a workman of any kind than to attempt to use an appliance supposed to be made for some particular purpose, only to find that through imperfect design or workmanship the article is not suited for the purpose at all? Particularly is such an occurrence aggravating if the workman happens to be away from the shop with no tools to remedy the defect without going back and wasting considerable valuable time.

It is doubtful if there is any class of work where such aggravations are more frequently met with than in electrical work ; for it is also doubtful if any class of manufactured articles contain more weak points and inconsistencies than many of the electrical specialties that are now being turned out.

The main object of many manufacturers of this line of goods seems to be to turn out an article that they can sell because it is cheap, never thinking that by dispensing with the services of a competent designer and hiring cheap, inexperienced help to put it together after it is designed, they are turning out an article which they can sell for 5 cents less than their competitor sells his goods, but that the workman who installs the appliance will waste 25 cents' worth of time in getting it to work in the unsatisfactory manner in which it must always remain.

The fault cannot be said to be wholly with the manufacturer of the goods, however ; for as long as construction companies will continue to buy the articles because they are cheaper in first cost, just so long will such articles continue to be manufactured.

A few of the defects recently observed in connection with some of the ordinary appliances used in electric light wiring can easily be enumerated. Most of these defects could easily be remedied by the manufacturers, if they would devote a little more attention to the manner in which the goods are manufactured, as well as to their sale after being imperfectly constructed. The corrections could, in most cases, be made without the articles costing any more for their manufacture. There is probably no electric wireman who is at all observing but could add considerably to the list without going far back in his experiences.

One of the most frequent exasperations met with by wiremen is the imperfect selection of screws by the manufacturer, with which to equip the appliance. Especially is this true in connection with branch and main blocks, switches and other such articles. How much profanity has been traceable to the fact that such articles were found at the last moment to contain screws too short to answer the required purpose, when brass screws a sixteenth of an inch longer would cost but a trifle more a gross?

A main block was recently noticed that was stamped 30 amperes. No intelligent electrician would think of trusting it to carry over half of that amount of current for any length of time ; but that was what the manufacturer called it good for. According to the underwriters' rules, which the manufacturer was supposed to observe, no smaller than No. 6 should be used to conduct 30 amperes of current. In the particular case where the block was to be used it would seldom happen that over 3 or 4 amperes would be required, and 15 was the maximum that could be taken. Nevertheless, a No. 6 wire had been used. But when it was connected to the main block it was found that such short binding screws had been put into the block that they would not reach across the wire until the washers with them had been removed, and then they would hold for only one or two threads. There was plenty of room in

the porcelain vase, however, to have permitted of using a screw an eighth of an inch longer.

Screws are sometimes found that are too long. But it is easier to cut one off than it is to lengthen it, unless it happens to be like another case recently observed in which screws were placed in such a position that it was impossible to get them out to even cut them off. This was in a three-point flush switch manufactured by a well-known specialty house; and for a combination of exasperating defects and fool designing these switches must be admitted to go ahead of anything that it has been the writer's misfortune to run across.

Not only were the binding screws in the switch terminals twice as long as was required, but the terminals had been tapped in such a position—before the switch was put together, of course—that the screw heads were directly in line with parts of the next terminals, and so close to them that the screws could neither be removed, nor was it possible to get at them in any manner with a screwdriver. After nearly an hour had been wasted, and the points of two knives broken in unscrewing, connecting and screwing up again, it was found on turning on the current that the screws were so long that the switch blade came in contact with them, causing a momentary short circuit every time it was turned. Not only did the screw heads short circuit the switch, but the terminal contacts themselves were so long that they caused a momentary short circuit with every turn.

It did not seem possible that any shop could manufacture an article without mechanics with enough common sense to notice some of the defects in the switch; and it is certain that the switches were never any of them tested at the shops, or all of the defects would have been easily discernible. While the firm may have been able to sell the goods cheaply, it is certain that no intelligent buyer would ever make a second purchase of them. This was not a single one of the lot that has been taken as an example, but all of that make of switches so far seen have the same defects.

It frequently happens that branch and main blocks have to be placed in rather small boxes at centers of distribution. How many wiremen have had difficulty, when doing this work, in having the terminal binding screws of the blocks, part or all of them on the sides so that it was almost, or quite, impossible to get at them with a screw driver in the close confines of the box? A little experience in the block designer and foresight in designing would easily remedy this defect; for it would be possible without any extra cost to so send out the terminals that all of the binding screws would face out.

Some three-point switches of another make were recently installed, every one of which had to be taken apart and the ends of the terminals filed off in order that, in turning, a momentary short circuit might not result.

The sockets made by one of the best-known manufacturers, and a firm that has the reputation of putting out as good wares as any in the market, could be made a little safer if they would form the porcelain base and the shell so that the small screws that bind the shell to its base did not come exactly opposite the terminal binding posts, making it very easy for any careless workman to bend the wire or leave the end too long, so that it is easy for the shell to be thrown in contact with the conducting wire. While this mistake should not be made with the present form of socket, it could not, if the design was changed, in this particular, which would not increase the cost of manufacture or decrease the ease of connecting.

Many rosette ears and their binding screws are so formed that unless the greatest care is exercised in connecting them there is danger of cutting the wires while doing that work. Other rosette ears are so placed that they come almost, or quite, in contact with the ceiling, thus making of little effect the careful removal of the insulated wire in all other points. Such rosettes have been noticed on stamped steel ceilings where the distance between the live ear and the grounded metal was not over 1-16th of an inch, but the insulated wire had been securely removed at least an inch from all grounded metal in other places.

Switch and rosette bases and other porcelain parts that have to be screwed to the wall were frequently formed with such small holes for the fastening screws that no regular stock screw can be found that is small enough and at the same time long enough to reach through the porcelain and the thick plaster.

Fixtures are also frequent examples of poor designing from the electrical point of view, and in a manner in which it would be just as easy to make them without the defects. Some combination fixtures are so made that there is no opportunity to run the wires between the casing and gas pipe without cutting out parts of the fancy ring work in a manner that disfigures the whole fixture. In some cases the casing cup at the place where the wires have to be soldered at the branching out for the individual lights are so small that it is almost impossible to get the soldered joints into them, when a larger cup would be fully as ornamental, and would cost little more.

Other fixtures have the arms for the individual lights of such a shape, or the holes insufficiently drilled out, that it is extremely difficult to get the wires through them at all, when fully as graceful turns could be given to them, at the same time avoiding all of this difficulty.

So the enumeration of such defects in manufacture or design might be continued. Most of these evils could be avoided if the manufacturers would give more care to the designing, or would hire men to do this work who have had actual experience in performing the work for which the appliance is intended, whether they are fully entitled to write "E.E." after their names or not, or whether or not they can as well calculate the impedance of an alternating current. If the man's knowledge permits him to do these things as well as to tell whether it would be possible to drive a screw with a screw driver, so much the better, but have some one that can tell about the screw driving at any rate. If the designing work does not require the services of such a man all the time, there are plenty of practical men to whom the article can be submitted, who can assist in pointing out the defects and suggest improvements.

Another thing that all manufacturers should do, but which the products of their factories prove is frequently left undone, is to submit every article after it is manufactured in exactly the size and shape in which it will be put on the market, to all of the tests to which it will be subjected in actual use, and the size and shape of no part should afterward be changed without again testing it, for a very slight change may frequently cause a short circuit or equally grave defect.

## A Comparison of Various Rapid Methods for Determining Carbon Dioxide and Carbon Monoxide.

By L. M. Dennis and C. G. Edgar.[1]

The value of gas analysis as an aid in the control and development of industrial processes is slowly being recognized by American manufacturers. Accompanying the increased use of this branch of analysis there seems to be, however, a tendency to adopt certain faulty methods of work to which it may be well to call attention. In industrial analyses chief stress will naturally be laid upon rapidity, and the accuracy demanded of the chemist will depend upon the nature of the work in hand. For example, in two processes in which carbon dioxide is regularly determined, it is sufficient in one case that the results be correct only within the range of 1 per cent., while in the other they should vary not more than one-tenth of 1 per cent. from the truth. In many cases, however, the analyst seems to be inclined to adopt some one form of apparatus and some one rapid method for the determination of each constituent and to adhere to this apparatus and method no matter what may be the conditions. Under such circumstances it is to be expected that the results obtained by different chemists on the same sample may show wide variations and even that the analyses of a single chemist, if his methods are not suited to the particular case in hand, may give rise to false deductions and cause financial loss to his employers. Difficulties similar to these were apparent, some years ago, in the analysis of iron and steel, and led to careful comparisons of the various methods by different chemists and to the development of standard methods of analysis. It was with the idea of making a beginning toward a similar comparison of some of the better known methods of gas analysis and of determining their relative accuracy and of ascertaining within what limits they might be relied upon, that Mr. Edgar undertook the work described below. It is not claimed that the results show the absolute accuracy of the different methods, but they doubtless give quite closely their relative accuracy and the time which the average chemist would need for the various determinations.

The receiver for holding the gas mixtures to be analyzed consisted of a thick-walled, round-bottomed flask of about 700 cc. capacity. Into the neck of the flask was inserted a two-hole rubber stopper carrying two capillary glass tubes, one of these tubes ending just below the stopper and the other extending to the bottom of the flask. After firmly wiring the stopper, the flask was inverted and supported in a ring stand. The shorter capillary tube was connected by heavy rubber tubing with a level bottle containing about 800 cc. of mercury. The longer tube was bent in such a manner that it could easily be connected with the capillary of a Hempel gas burette. In collecting the samples for analysis, the air in the flask was first completely displaced by mercury from the level bottle and then measured portions of the gases to be mixed were run in through the longer capillary from a

1. *Jour. Am. Chem. Society.*

Hempel gas burette, this latter also containing mercury as the confining liquid. The flask was then shaken for 5 minutes and allowed to stand for some time, so that the gases might thoroughly mix. The gas mixture was at all times kept under a pressure slightly greater than that of the atmosphere, so as to prevent the possible entrance of air.

*Determination of Carbon Dioxide.*—The gas mixture to be analyzed was prepared by mixing known volumes of air from outside the laboratory and carefully washed carbon dioxide prepared in a Kipp apparatus. The oxygen and nitrogen which might be contained in the carbon dioxide were not determined because the absolute accuracy of the different methods was in this work only of minor importance. Different mixtures of 500 cc. each were prepared, containing by measurement 20, 30 and 40 per cent. of carbon dioxide. The solution of potassium hydroxide used for absorbing the carbon dioxide had the concentration recommended by Clemens Winkler;[1] namely, one part potassium hydroxide to four parts of water. The different forms of apparatus used were those devised by Honigmann, Bunte, Orsat, Elliot, and Hempel. Water was used in every case as the confining liquid. After each determination every measuring burette was rinsed with dilute hydrochloric acid to remove any potassium hydroxide that might accidentally have been introduced.

*Honigmann's Burette.*—This was described to Professor Clemens Winkler by Moritz Honigmann, in a letter dated March 15, 1881. The method of using it which we adopted was that given by Winkler,[2] except that in filling the burette with the gas, instead of aspirating the gas through the burette until the air has been completely displaced, the burette was first filled with water which had been saturated with the gas and the water was then displaced by gas from the receiver.

| Sample No. | Carbon Dioxide. Per Cent. | Check Result with Hempel's Apparatus. Per Cent. | Results with Honigmann's Apparatus. Per Cent. | Time in Minutes. |
|---|---|---|---|---|
| I | 20 | 19.9 | 19.6 | 10:00 |
| | | | 18.9 | 9:00 |
| | | | 19.1 | 9:30 |
| II | 20 | 19.85 | 19.8 | 7:10 |
| | | | 19.8 | 6:30 |
| | | | 19.7 | 6:15 |
| III | 20 | 20.1 | 20.0 | 6:00 |
| | | | 19.8 | 5:30 |
| | | | 19.8 | 5:00 |
| IV | 30 | 29.9 | 29.2 | 6:30 |
| | | | 29.1 | 7:10 |
| | | | 29.0 | 5:40 |
| V | 30 | 29.7 | 29.4 | 5:00 |
| | | | 29.5 | 5:00 |
| | | | 29.6 | 5:30 |
| VI | 30 | 29.6 | 29.3 | 5:30 |
| | | | 29.4 | 5:15 |
| | | | 29.5 | 5:00 |
| VII | 40 | 39.9 | 39.2 | 6:10 |
| | | | 39.0 | 6:00 |
| | | | 38.9 | 5:30 |
| VIII | 40 | 40.1 | 39.7 | 6:00 |
| | | | 39.8 | 6:15 |
| | | | 39.2 | 5:35 |
| IX | 40 | 39.9 | 38.9 | 5:30 |
| | | | 39.5 | 6:00 |
| | | | 39.4 | 6:10 |

Averages with Honigmann's apparatus—

| | |
|---|---|
| 20 per cent. | 19.6 per cent. |
| 30 " | 29.2 " |
| 40 " | 39:31 " |

*Bunte's Burette.*[3]—Method of use was as described by Winkler, p. 84.

| Sample No. | Carbon Dioxide. Per Cent. | Check Result with Hempel's Apparatus. Per Cent. | Results with Bunte's Apparatus. Per Cent. | Time in Minutes. |
|---|---|---|---|---|
| X | 20 | 19.9 | 19.8 | 8:30 |
| | | | 19.7 | 8:15 |
| | | | 19.8 | 8:35 |
| XI | 20 | 20.1 | 19.8 | 8:30 |
| | | | 19.7 | 8:25 |
| | | | 20.1 | 8:50 |
| XII | 20 | 20.0 | 19.8 | 8:10 |
| | | | 19.6 | .... |
| | | | 19.8 | 8:00 |
| XIII | 30 | 29.9 | 29.7 | 8:20 |
| | | | 29.8 | 8:45 |
| | | | 29.6 | 8:00 |
| XIV | 30 | 30.1 | 29.9 | 8:20 |
| | | | 29.7 | 8:15 |
| | | | 30.0 | 8:40 |
| XV | 30 | 29.8 | 29.8 | 8:10 |
| | | | 29.6 | 8:35 |
| | | | 29.7 | 8:15 |
| XVI | 40 | 40.0 | 38.9 | 8:15 |
| | | | 39.3 | 8:00 |
| | | | 39.5 | 8:10 |
| XVII | 40 | 39.8 | 39.5 | 8:25 |
| | | | 39.3 | 8:30 |
| | | | 39.5 | 8:00 |
| XVIII | 40 | 39.9 | 39.3 | 8:00 |
| | | | 39.4 | 8:15 |
| | | | 39.5 | 8:25 |

Averages with Bunte's apparatus—

| | |
|---|---|
| 20 per cent. | 19.8 per cent. |
| 30 " | 29.7 " |
| 40 " | 39.33 " |

*Orsat's Apparatus.*—The form of this apparatus which we employed was that now made by Robert Muencke, Berlin, and it was used in the manner described by Winkler, p. 89.

| Sample No. | Carbon Dioxide. Per Cent | Check Result with Hempel's Apparatus. Per Cent. | Results with Orsat's Apparatus. Per Cent. | Time in Minutes. |
|---|---|---|---|---|
| XIX | 20 | 19.8 | 19.7 | 7:00 |
| | | | 19 6 | 8:00 |
| | | | 19 8 | 7:45 |
| XX | 20 | 19.9 | 19.6 | 8:15 |
| | | | 19.7 | 8:00 |
| | | | 19.6 | 7:15 |
| XXI | 20 | 19.8 | 19.5 | 8:10 |
| | | | 19.6 | 8:00 |
| | | | 19.5 | 7:50 |
| XXII | 30 | 29.8 | 29.2 | 6:50 |
| | | | 29.3 | 7:00 |
| | | | 29.0 | 6:40 |
| XXIII | 30 | 29.7 | 29.2 | 7:00 |
| | | | 29.3 | 7:15 |
| | | | 29.3 | 8:00 |
| XXIV | 30 | 29.9 | 29.3 | 7:00 |
| | | | 29.4 | 7:35 |
| | | | 29.3 | 7:40 |
| XXV | 40 | 40.0 | 39.2 | 7:00 |
| | | | 39.1 | 6:10 |
| | | | 39.2 | 6:00 |
| XXVI | 40 | 39.9 | 39.3 | 5:45 |
| | | | 39.2 | 6:00 |
| | | | 39.3 | 6:10 |
| XXVII | 40 | 39.8 | 39.4 | 6:50 |
| | | | 39.3 | 7:10 |
| | | | 39.4 | 7:00 |

Averages with Orsat's Apparatus—

| | |
|---|---|
| 20 per cent. | 19.62 per cent. |
| 30 " | 29.45 " |
| 40 " | 39.46 " |

*Elliot's Apparatus.*—This apparatus is described in the *Chem. News*, 1881, 44, 289.

| Sample No. | Carbon Dioxide. Per Cent. | Check Result with Hempel's Apparatus. Per Cent. | Results with Elliot's Apparatus. Per Cent. | Time in Minutes. |
|---|---|---|---|---|
| XXVIII | 20 | 19.8 | 19.7 | 6:50 |
| | | | 19.6 | 7:10 |
| | | | 19.7 | 7:00 |
| XXIX | 20 | 19.9 | 19.7 | .... |
| | | | 19.6 | .... |
| | | | 19.5 | .... |
| XXX | 20 | 20.0 | 19.8 | .... |
| | | | 19.5 | .... |
| | | | 19.8 | .... |
| XXXI | 30 | 30.0 | 29.6 | 8:15 |
| | | | 29.5 | 8:10 |
| | | | 29.6 | 8:40 |
| XXXII | 30 | 28.9 | 29.5 | .... |
| | | | 29.7 | .... |
| | | | 29.6 | .... |
| XXXIII | 30 | 29.9 | 29.4 | 7:10 |
| | | | 29.6 | 7:00 |
| | | | 29.5 | 6:50 |
| XXXIV | 40 | 39.9 | 39.2 | 6:20 |
| | | | 39.3 | 6:15 |
| | | | 39.0 | 6:10 |
| XXXV | 40 | 39.9 | 39.5 | 6:50 |
| | | | 39.4 | 7:00 |
| | | | 39.8 | 6:35 |
| XXXVI | 40 | 39.8 | 39.3 | 7:00 |
| | | | 39.6 | 6:50 |
| | | | 39.5 | 6:10 |

1. Winkler: Lehrbuch der Technischen Gasanalyse, 2te Auflage, 1892, p. 68.
2. Winkler: Lehrbuch der Technischen Gasanalyse, 2te Auflage, 1892, p. 82.
3. *Journal fur Gasbeleuchtung*, 1877, p. 447.

Averages with Elliot's Apparatus—

| | |
|---|---|
| 20 per cent. | 19.66 per cent. |
| 30 " | 29.55 " |
| 40 " | 39.41 " |

*Hempel's Apparatus.*—The gas burette was that shown in Fig. 17 of the English edition of "Hempel's Methods of Gas Analysis." The absorption pipette shown in Fig. 21, *b*, was employed, this being filled with iron wire gauze and potassium hydroxide, as described on page 157. In some of the determinations given below the water was allowed to run down the walls of the burette for the usual time, three minutes. In others this time was shortened to one-half a minute to see whether the work could be hastened without too great a sacrifice of accuracy.

| Sample No. | Carbon Dioxide Per Cent. | Results with Hempel's Apparatus. Per Cent. | Time Allowed for Running Down of Water. | Time in Minutes. |
|---|---|---|---|---|
| I..... | 20 | 19.9 | 3 min. | 10:00 |
| II..... | 20 | 19.85 | 3 " | 9:00 |
| III..... | 20 | 20.1 | 3 " | 10:00 |
| X. ... ..... | 20 | 19.9 | 3 " | 8:50 |
| XI. ..... | 20 | 20.1 | 3 " | 9:00 |
| XII..... | 20 | 20.0 | 3 " | 8:40 |
| XIX..... | 20 | 19.8 | 30 sec. | 4:00 |
| XX..... | 20 | 19.9 | 30 " | 4:15 |
| XXI..... | 20 | 19.8 | 30 " | 4:09 |
| XXVIII .... | 20 | 19.8 | 30 " | 4:00 |
| XXIX..... | 20 | 19.9 | 30 " | 4:10 |
| XXX..... | 20 | 20.0 | 30 " | .... |
| IV. ..... | 30 | 29.9 | 3 min. | 9:00 |
| V..... | 30 | 29.7 | 3 " | 9:00 |
| VI..... | 30 | 29.6 | 3 " | 9:00 |
| XIII..... | 30 | 29.9 | 3 " | 9:00 |
| XIV. ..... | 30 | 29.9 | 3 " | 9:50 |
| XV..... | 30 | 30.1 | 3 " | 9:00 |
| XXII. ..... | 30 | 29.8 | 30 sec. | 3:30 |
| XXIII. ..... | 30 | 29.7 | 30 " | 4:00 |
| XXIV. ..... | 30 | 29.9 | 30 " | 3:50 |
| XXXI..... | 30 | 30.0 | 30 " | 4:00 |
| XXXII. .... | 30 | 29.9 | 30 " | 4:10 |
| XXXIII. ... | 30 | 29.9 | 30 " | 4:05 |
| VII. ..... | 40 | 39.9 | 3 min. | 9:00 |
| VIII. ..... | 40 | 40.1 | 3 " | 8:45 |
| IX. ..... | 40 | 39.9 | 3 " | 9:00 |
| XVI. ..... | 40 | 40.0 | 3 " | 8:50 |
| XVII. ..... | 40 | 39.8 | 3 " | 9:00 |
| XVIII. ..... | 40 | 39.9 | 3 " | 9:00 |
| XXV ..... | 40 | 40.0 | 30 sec. | 4:00 |
| XXVI..... | 40 | 39.9 | 30 " | 3:30 |
| XXVII. .... | 40 | 39.8 | 30 " | 4:10 |
| XXXIV..... | 40 | 39.9 | 30 " | 4:15 |
| XXXV..... | 40 | 39.9 | 30 " | 4:25 |
| XXXVI .... | 40 | 39.8 | 30 " | 6:15 |

Averages with Hempel's apparatus—

| | | |
|---|---|---|
| 20 per cent. | 3 min. running down | 19.97 per cent. |
| 20 " | 30 sec. " " | 19.87 " |
| 30 " | 3 min. " " | 29.85 " |
| 30 " | 30 sec. " " | 29.87 " |
| 40 " | 3 min. " " | 39.93 " |
| 40 " | 30 sec. " " | 39.89 " |

[To be Concluded.]

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

"TRAVELER," writing under date of the 2d inst., respecting the lease of the Philadelphia gas works, says:

These 26 words, from the Philadelphia daily papers, of December 1st, 1897, record history:

"The transfer of the city gas works to the United Gas Improvement Company was made formally at midnight, and the Company is now running the works."

In other words, after 30 years of mismanagement, corruption, bad service, and losing money in the operation of its gas works, the city of Philadelphia has realized the facts, and by the deliberative action of its duly authorized officers, has turned its gas plant over to a private corporation and retired from the business of gas making.

The proposition upon the part of the United Gas Improvement Company, to lease and operate the works for a term of years, the favorable action upon such offer by both branches of City Councils, and the signing by the Mayor of the bill, have been matters of knowledge to your readers, and the completion of the negotiations has been a source of congratulation to the intelligent thinking citizens of Philadelphia.

Some of the sidelights, however, are not uninteresting. The United Gas Improvement Company made a straight business offer, based on facts that were incontrovertible and convincing; but, nevertheless, no matter of such magnitude could be expected to go through without exciting positive opposition.

In the first place, those in control of the gas works were not inclined to let go; quite naturally, and for reasons that would not be sweet sounding were one to go into their details. Then, politics—always effervescent in Pennsylvania—cropped up and the lease became an "issue;" next, others figuring that the United Gas Improvement Company was not in the contest for its health, etc., and must be expecting to exercise its prerogative of making some money, decided that they wanted to be "in it," and straightway opposed the proposed lease. Following the lead of the malcontents mentioned came the horde of "municipal control" enthusiasts, blind to the disgraceful leakage account of 20 to 25 per cent., ignoring the fact that the city's cost was 50 per cent. higher than what they were actually buying a part of their gas for, forgetting the wretched service, in almost every respect, argued and re-argued about the city's duty of self-supply and ownership, *ad libitum, ad nauseam.* Altogether they aggregated, if not a very respectable, at least a very noisy opposition. The political end procured the services of the *Inquirer*, a pronounced political organ, and a campaign of self-interest and preservation was started that was undeniably clever.

The opposition hadn't been through political campaigns before, or run yellow journals for nothing. Cartoons, sarcasm, charges and argument appeared, and letters from "Taxpayer" and "Citizen" and "Pro Bono Publico" were in every issue of the *Inquirer.* Reporters hustled through the gas works to gather "facts" for the relation of most pathetic interviews with the stokers—men so competent to speak—of what would happen if the city let go the works; the usual inexact gas technique of a newspaper being plentifully bespattered throughout, to give a verisimilitude of fact. Mass meetings were organized to denounce the steal, and torch light "demonstrations" were easily cooked up by drafting in the army of bicyclists, open to anything for an evening's entertainment. "Women's Leagues" and "Reform Clubs" and "Labor Unions" were inspired to get together, and resolutions and petitions were hurled in galore at a defenceless Council. The *Inquirer* meantime increased its circulation nicely, and got gobs of glory from those who were easily deceived by such newspaper tactics. Of real, sincere opposition, however, there was but little. The great majority of intelligent citizens, having known for years that the service was poor and that the gas works was a hotbed of politics, heartily welcomed anything that would better the former and remove it from the latter. When such concerns as Cramp's Shipyard, the Baldwin Locomotive Works (through their managements), and scores and scores of others, came out flat-footedly in favor of the lease, the trend of public belief was obvious. Further than that, every newspaper of any moment or good repute in the city, with the single exception of the *Inquirer*, openly advocated it. The sincere, disinterested opposition was practically limited to those who oppose progress in any form.

When I first visited Philadelphia, three or four years ago, it had the vilest horse car system and the worst cobble stone paved streets in the country. The Union Traction Company, in exchange for the privilege of operating by electricity, offered to install a modern trolley system, asphalt the streets and keep them in repair for 10 years as well. The usual opposition from the mossback element was made, but fortunately without avail, and Philadelphia shortly was incidentally transformed, from one of the worst paved cities in the country to one of the best, and also secured a superb trolley service. At the very idea of going back to horse cars the trolley mossbacks would be the first to howl. These same anti-trolley kickers have duly kicked at any change in the gas works—"what always has been good enough should continue to be;" and it is safe wagering that five years from now these constitutional objectors will equally howl at the city taking up its gas supply again.

The opposition died hard. When woefully outvoted, and the lease was favorably passed upon by the City Council, it rushed to the courts, and bills in equity, enjoining everything in sight, were thicker than flakes of snow during a storm of that sort. It was alleged that the city had not a legal right to lease its own property; that it was its duty to supply gas; that it ought to lease to some of the alleged higher bidders; that the city gas loans were imperilled, and the widows and

orphans injured; and that the U. G. I. Co. wasn't any good anyway, or its finances as repesented.

The matter was argued before the full bench of the Common Pleas Court, and Judge Arnold's opinion was so full of common sense that it has knocked the above allegations higher than William Penn on the City Hall tower. He recites, in brief, that the city can do what it pleases with its own. It rents docks and markets, and has an equal right to rent its gas works. Further, while it has the power to supply gas, it is not obliged to do so; it can delegate the supply to anyone it pleases; and that it has discretionary power in accepting, selecting or rejecting any or all bids, and was morally compelled to consider the responsibility of the bidder quite as much as the amount of the bid. Also, that as long as the gas loans were secured and guaranteed by the city, how the city got the funds, or the details of the gas supply need not worry the loan holders.

This decision is looked upon as practically settling the matter. Talk of appeal is heard; but no one looks for it, or for any reversal of the Court's decision, if it is appealed. The U. G. I. Co. is in the works (it has possession and its signs up), and has already started in on the work of bettering the service. Meters, dust covered for years, will be tested, as sadly needed; red tape and indifference will be eliminated. It will now be possible for an inquirer to see a gas stove upon request—not so in the past. Large mains sadly needed have been ordered by telegraph. Sub-stations will be created and a customer not made to travel weary miles to pay his gas bill. Meter inspectors will inspect, and cease playing "policy" all morning under the shadow of the City Hall. A decent, businesslike service will be inaugurated, and the city will be the gainer. So, if the United Gas Improvement Company in so doing can lease the works and make some money on $1 gas, it unquestionably is entitled to such reward or recompense.

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Mr. D. F. Burritt, Manager of the Rockville (Conn.) Gas and Electric Company, writing to the Journal under date of November 26th, says: "We do not travel much, but we have a gas consumer who does. You may say there is nothing strange about this, and there is not, until we tell you that the person in question takes his gas cooking stove, gas jets and gas radiator along with him when he travels. This well known citizen, Mr. William Stafford, is our enterprising night lunch man, and it was at our solicitation that he ordered his new and commodious night lunch wagon piped for gas. He has a 4-burner gas cooking stove constantly in use, a Bunsen burner under a coffee tank, and one under a hot water tank, each controlled by stopcocks conveniently located. Five gas jets, on short, pretty brackets, with etched glass shades, are distributed around the interior of the wagon, and are kept constantly lighted. To make the comfort of this modern movable restaurant complete, a gas radiator of modern design warms the apartment. About 4 o'clock in the afternoon the lunch wagon can be seen coming down Main street, from the house of its owner a mile away, and when it reaches the place beside a low bank wall designated for its station, the man in charge couples a hose passing through the bottom of the wagon to a connection inside the meter box which stands in a niche in the wall. The service cock is turned on, the door is shut and locked, and the gas in the wagon is lighted. The brightly illuminated stained glass windows can be seen for a long distance, and the outfit and beacon have become (portable) landmarks to many a belated citizen homeward bound, who, when he thinks of the warmth and cheer within the *cafe*, and the hot things served there right off the gas stove, generally gives Mr. Stafford a call."

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Mr. C. J. Luther resigned the position of Superintendent to the Rome (N.Y.) Gas and Electric Light Company, the resignation to take effect on the 1st inst. The employees of the Company presented Mr. Luther with a handsome walking stick, topped with gold. He is about to engage in a new line of business, arrangements for the carrying on of which have been perfected.

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The Messrs. F. W. and S. C. Freese inform us that they have sold their interests, which amounted to ownership, in the Albion (Mich.) Gas and Coke Company, at a price not far from $30,000. The business of the Company will remain under the direction of the Messrs. Freese until the new owners have named an executive management. The name of the Company will not be changed.

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More by sheer accident than by concerted delving we are in possession of a circular letter, the tone and suggestion of which are rich and curious, even in these times of odd "combines" and schemes in "restraint of commerce." The text of the circular letter is appended:

"63 Centre Street, New York, Nov. 19, 1897.

"Dear Sir: At a meeting held Nov. 18th, at the Windsor Hotel, an invitation of the Master Plumbers' and the Master Steamfitters' Associations in Greater New York, a proposed agreement was submitted to those present. In order to consider the matter as presented, you are requested to attend a meeting of manufacturers and jobbers of plumbers, steam and gasfitters' supplies, to be held at the United States Hotel, Fulton street, on Tuesday, November 23, at 10:30 A.M. One of the requirements of the proposed agreement is that after January, 1898, no supplies shall be sold at a discount to anybody in Greater New York, unless he be a member of the Master Plumbers' or the Master Steamfitters' Associations of the city of New York. Under the proposed agreement a list of members to whom only you can sell will be furnished by the aforesaid Associations, which they will correct semi-monthly. As this meeting will be a very important one, I hope you will allow nothing to interfere with your attendance.—Yours truly, B. Frank Hooper, Chairman."

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Of course, no representative of the Journal was present at the meeting, nor have we heard from anyone who was present at the conference what conclusions were reached there by Chairman B. Frank Hooper and his associates. The proposition, however, lacks nothing in the matter of strength.

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During the last week in November the City Council of St. Joseph, Mich., granted a franchise to the projectors of the Excelsior Gas Company, who propose to erect, maintain and operate a gas works in St. Joseph.

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Despite the adverse report of the Board of Trustees, of Larchmont, N.Y, on the application of the Larchmont Gas Company for permission to distribute gas in that place, it is not at all improbable that in the near future a more favorable feeling regarding the gas project will prevail.

---

At a meeting of the Brooklyn (N. Y.) Board of Aldermen, held last Monday, two applications for lighting franchises were received. One of these was handed in by Mr. Edward F. Linton, who asked for an ordinance giving the Brooklyn Gas and Electric Light Company permission to lay mains and string wires in Brooklyn for the supply of gas and the conveying of electric currents in the named city. The other petition was from Mr. Henry J. Braker, as President of the New Power and Light Company, who asked for powers similar to those sought by Mr. Linton's Company. Both petitions were referred to the Committee on Electricity and Gas, where it is likely they will be held until the city of Brooklyn becomes the Borough of Brooklyn.

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At the same meeting of the Board the Committee on Electricity and Gas reported a resolution permitting the Flatbush Gas Company to extend its mains throughout the city. The resolution also authorized the Company to lay conduits for carrying wires for the distribution of electric currents throughout the city. The Board accepted and indorsed the reports of the Committee. The Flatbush Company is in perfect working harmony with the purposes and objects of the Brooklyn Union Gas Company.

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A correspondent forwards the following: "The authorities of Nelson, British Columbia, have granted a franchise to the projectors of the Nelson Gas Company. The life of the franchise is limited to 10 years, at the end of which period the city shall have the right to purchase the plant, the value of the same to be settled by arbitration, the award, however, to be subject to an additional 4 per cent. for interest on the investment. The Company is obligated to pay to the city 2 per cent. on its gross earnings for the first year; 3 per cent. the second year; and 5 per cent. for each of the remaining years. The site for the works is subject to the approval of the Council; the pipes are to be laid in the cross streets and alleyways, excepting where impracticable, and then only with and by the sanction of the Council; a bond is to be given for all repairs to streets, subject to approval of the city engineer. Gas is to be supplied at a charge not to exceed $2.50 per 1,000 cubic feet, and a bond is required that work on construction account is to be commenced in 90 days, and to be completed in 9 months from the signing of the ordinance."

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The following is the text of the ordinance now before the City Council, of Camden, N.J., under which it is proposed to saddle an opposition gas company on that city:

"An ordinance to authorize the 'Peoples Gas Company,' of Camden, N. J., to lay pipes in the streets, lanes, alleys and squares of the city of Camden.

"Be it ordained by the City Council of the City of Camden:

"Section 1.—That the 'Peoples Gas Company,' of Camden, N. J., a corporation duly formed under the provisions of 'An act to authorize the formation of gas light corporations and regulate the same,' approved April 21, 1876, and the supplements thereto, be and the same is hereby authorized to use and occupy the streets, avenues, lanes, alleys, highways, squares and the public grounds in said city, and for the construction of necessary street boxes and valves, and for the making and maintenance of the necessary connections with the houses and other buildings.

(*Continued on page* 894.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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MONDAY, DECEMBER 6, 1897.

(*Continued from page* 893.)

"Sec. 2. That said Company shall, within 90 days after the approval of said ordinance, file in the office of the City Clerk, of the said city of Camden, N. J., a certificate of acceptance of all the provisions and conditions of this ordinance, which said certificate of acceptance shall be executed under the corporate seal of said Company, duly executed by the President and Secretary of said Company.

"Sec. 3.—That said Company shall, at the time of the acceptance of this ordinance, pay to the City Clerk the costs of publishing the same.

"Sec. 4.—That said Company shall, at the time of the acceptance of this ordinance, enter into an agreement with the city of Camden to commence work within one year from the date of the approval of this ordinance.

"Sec. 5.—That said Company shall, at all times, sell and furnish such quantity or quantities of gas as may be required for use by any person, company or corporation at a cash price not exceeding the sum of $1 for every 1,000 cubic feet of gas consumed, and shall furnish and lay all service pipes from its mains to the building line established by the said city free of cost to consumers.

"Sec. 6.—That said Company shall enter into bond to the said city of Camden in the penal sum of $25,000, conditioned that it will comply with the terms of this ordinance and the agreements hereinbefore mentioned, and that it will not unnecessarily disturb any street, lane, alley or square, occupied or used by it; but will complete each part of the work commenced as speedily as possible, and repair and restore said street, lanes, alleys or squares to as good condition as existed before said work was commenced, and will indemnify and save harmless the city of Camden from all damages that may arise; to wit, from the laying of pipes in the streets of said city or conveying gas through the same."

THE Buffalo City (N.Y.) Gas Company has completed its permanent executive management by naming the following officers: Directors, Henry Seligman, Stephen Peabody, Emerson McMillin, Robert C. Pruyn, Robert L. Fryer, B. C. Rumsey, E. W. Eames, J. J. Albright, Chas. Berryck and D. O'Day; President, Emerson McMillin; Vice-President, Robt. L. Fryer; General Manager, John H. Cowing; Treasurer, Stephen Peabody; Secretary, Joseph Krumholz; Assistant Secretary, W. F. Douthirt; Executive Committee, Emerson McMillin, Robt. L. Fryer, H. Seligman, R. C. Pruyn and Stephen Peabody.

THE City Attorney of Topeka, Kas. (Mr. Bird), at the instigation of the local authorities, has prepared an ordinance which declares that the selling rate for gas in Topeka shall not exceed $1 per 1,000 cubic feet.

IN further connection with the Peoples Gas Company, of Trenton, N. J., it may be noted that its capital is $325,000, of which 10 per cent. has been paid in, and that its officers are: Directors, John F. Starr, Jr., Maurice A. Rogers, J. Rufus Eastlack, Louis T. Derousse, Isaac Ferris, Jr., E. Stockton Woodward, Chas. F. Eastlack, W. J. Bradley, Watson Depuy, F. C. Somers, David Baird, Lewis Perrine and T. C. Barr; President, Lewis Perrine; Vice-President, John F. Starr, Jr.; Secretary, M. A. Rogers; Treasurer, T. C. Barr.

"MR. JAMES STEWART, Chief Gas Meter Inspector, State of New York," as the Buffalo *Express* puts it, was in Buffalo a few days ago. The *Express* further remarks that "he came to satisfy himself as to the exact status of the affairs of the Buffalo Gas Companies since the incorporation of the Buffalo City Gas Company." All of which goes to show that Mr. Stewart is a very important man in the gas business of New York State; but we wonder how much he found out about the aforesaid "exact status."

MR. J. W. MURDOCK, Manager of the Ottawa (Ills.) Gas Light and Coke Company, has been illustrating in practical way, in the show rooms of the Company, corner of Madison and Court streets, the advantages of improved burners for general illuminating use. The exhibition has proven a profitable one for the Company.

IT is said that the proprietors of the Duluth (Minn.) Gas and Water Company have agreed to sell their plants and rights to the city for the sum of $1,250,000.

## The Market for Gas Securities.

The trading in Consolidated was not voluminous during the week, but it was transacted at higher values than those for the preceding week. The shares sold as high as 190 ex div., and as low as 184 ex div., the ruling figure today (Friday) being 185½ to 186. The Company has made application to the Stock Exchange to list additional stock amounting to $3,648,000. No doubt this is a positive practical move in the plan for ultimate consolidation. Standard issues are somewhat weaker.

A postponement of the Amsterdam merger agreement to the 14th inst. has been agreed to. Mutual is steady at 320 to 350. The legislative rumor mongers now have it that an investigating committee is to be appointed by the Assembly to "look into" the standing of the gas interests of Greater New York. Brooklyn Union is strong and higher, at 120 to 121, and Peoples, of Chicago, is also in demand, at 94¾ to 95. Baltimore Consolidated shows no change, Bay State is inert, at 5⅛ to 5¼, and Lacledes are notably higher.

## Gas Stocks.

**Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.**

35 WALL ST., NEW YORK CITY.

DECEMBER 6.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

| *N. Y. City Companies.* | *Capital.* | *Par.* | *Bid.* | *Asked.* |
|---|---|---|---|---|
| Consolidated | $35,430,000 | 100 | 185 | 185¼ |
| Central | 500,000 | 50 | | .. |
| " Scrip | 220,000 | .. | 100 | . |
| Equitable | 4,000,000 | 100 | 280 | 290 |
| Bonds, 6's | 1,000,000 | 1,000 | 105 | . |
| " 1st Con. 5's | 2,300,000 | 1,000 | 114 | . |
| Metropolitan Bonds | 658,000 | .. | 108 | 112 |
| Mutual | 3,500,000 | 100 | 320 | 350 |
| " Bonds | 1,500,000 | 1,000 | 100 | 102 |
| Municipal Bonds | 750,000 | . | .. | . |
| Northern | 150,000 | 50 | .. | |
| " Bonds | 150,000 | 1,000 | .. | 98 |
| New York and East River | 5,000,000 | 100 | 79 | 81 |
| Preferred | 2,000,000 | 100 | 98 | 104 |
| Bonds 1st 5's | 3,500,000 | 1,000 | 112 | 113 |
| " 1st Con. 5's | 1,500,000 | .. | 105 | 106⅛ |
| Richmond Co., S. I. | 348,650 | 50 | 50 | .. |
| " Bonds | 100,000 | 1,000 | .. | .. |
| Standard | 5,000,000 | 100 | 139 | 142 |
| Preferred | 5,000,000 | 100 | 145 | 155 |
| Bonds, 1st Mortgage, 5's | 1,500,000 | 1,000 | 114 | 115 |
| Yonkers | 299,650 | 50 | 130 | .. |
| *Out-of-Town Companies.* | | | | |
| Brooklyn Union | 15,000,000 | 100 | 120 | 121 |
| " " Bonds (5's) | 15 000,000 | 1,000 | 111 | 112 |
| Bay State | 50,000,000 | 50 | 5⅜ | 5¼ |
| " Income Bonds | 2,000,000 | 1,000 | .. | 35 |
| Boston United Gas Co.— | | | | |
| 1s Series S. F. Trust | 7,000,000 | 1,000 | 93 | .. |
| 2d " " " | 3,000,000 | 1,000 | 80 | 81 |
| Buffalo Mutual | 750,000 | 100 | 125 | .. |
| " Bonds | 200,000 | 1,000 | 95 | 100 |
| Central, San Francisco | 2,000,000 | .. | 95 | .. |
| Chicago Gas Company | 25,000,000 | 100 | 97¼ | 97⅜ |
| Guaranteed Gold Bonds | 7,650,000 | 1,000 | 104 | 104¼ |
| Columbus | 1,069,000 | . | 91 | 94 |
| 1st Mortgage | 1,085,000 | .. | .. | 96 |
| Consumers, Jersey City | 2,000,000 | 100 | 75 | .. |
| " Bonds | 600,000 | 1,000 | 101 | 103 |
| Cincinnati G. & C. Co. | 8,500,000 | 100 | 203 | 204 |
| Consumers, Toronto | 1,600,000 | 50 | 184½ | 187 |
| Capital, Sacramento | 500,000 | 50 | .. | 35 |
| Bonds (6's) | 150,000 | 1,000 | .. | .. |
| Consolidated, Baltimore | 1,000,000 | 100 | 53¾ | 54 |
| Mortgage, 6's | 3,600,000 | .. | 107 | 107½ |
| Chesapeake, 1st 6's | 1,000,000 | .. | .. | .. |
| Equitable, 1st 6's | 910,000 | .. | .. | .. |
| Consolidated, 1st 5's | 1,490,000 | .. | .. | .. |
| Detroit | 4,000,000 | | 55¾ | 56 |
| " Con. Bonds | 4,312,000 | .. | 97½ | 98 |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1,000 | .. | 101 |
| Fort Wayne | 2,000,000 | .. | 81 | 85 |
| " Bonds | 2,000,000 | .. | 98 | 95 |
| Hartford | 750,000 | 25 | .. | 145 |
| Indianapolis | 2,000,000 | .. | 118 | 125 |
| " Bonds, 6's | 2 650,000 | .. | 107 | 109 |
| Jersey City | 750,000 | 20 | 180 | .. |
| Lafayette Gas Co., Ind. | 1,000,000 | 100 | 86 | 88 |
| Bonds | 1,000,000 | 1,000 | 92 | 94 |
| Louisville | 2,570,000 | 50 | .. | .. |
| Laclede, St. Louis | 7,500,000 | 100 | 43¼ | 43½ |
| Preferred | 2,500,000 | 100 | 92 | 96 |
| Bonds | 9,084,400 | 1,000 | 101 | 102 |
| Little Falls, N. Y. | 50,000 | 100 | .. | 100 |
| Bonds | 25,000 | .. | .. | 100 |
| Montreal, Canada | 2,000,000 | 100 | 200 | . |
| Newark, N. J., Gas Co. | 1,000,000 | .. | 200 | 220 |
| Bonds, 6's | 4,000,000 | .. | 123 | 130x |
| New Haven | 1,000,000 | 25 | 225 | .. |
| Oakland, Cal. | 2,000,000 | .. | 53½ | 54 |
| " Bonds | 750,000 | .. | .. | .. |
| Peoples G. L. & Coke Co., of Chicago | 25,000,000 | 100 | 94¾ | 95 |
| Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage | 20,100,00 | 1,000 | .. | 108 |
| 2d " | 2,500,000 | 1,000 | 104 | 105 |
| Peoples, Jersey City | 500,000 | 50 | .. | 175 |
| Rochester Gas & Elec. Co. | 2,150,000 | 50 | .. | .. |
| Preferred | 2,150,000 | 50 | 83 | .. |
| Consolidated 5's | 2,000,000 | | 87½ | 90 |
| San Francisco, Cal. | 10.000,000 | 100 | 94 | 94½ |
| St. Paul Gas Light Co. | 1,500,000 | 100 | 49 | 51 |
| 1st Mortgage, 6's | 650,000 | .. | 84 | 87 |
| Extension, 6's | 600,000 | .. | .. | .. |
| General Mortgage, 5's | 2,400,000 | . | 88 | 90 |
| Syracuse, N. Y. | 2,500,000 | 25 | 18 | 20 |
| Bonds | 1,000 000 | | 94 | 97 |
| Washington, D. C | 2,000,000 | 20 | 250 | |
| Western, Milwaukee | 4,000,000 | 100 | 83 | 85 |
| Bonds, 5's | 3,556,000 | . | 102 | 103 |
| Wilmington, Del. | 850,000 | 50 | 200 | 202 |

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The American Gas Engine Co., Phila., Pa..... 911
Backus Water Motor Co., Newark, N. J..... 896

### ENGINES AND BOILERS.

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W. G. & G. Greenfield, East Newark, N. J..... 896

### PURIFIER SCREENS.

John Cabot, New York City..... 898

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### INSTANTANEOUS WATER HEATERS.

Gilbert & Barker Mfg. Co., New York City ..... 897

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### GASHOLDERS.

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Management of Small Gas Works ..... 902
Handbook on Gas Engines..... 913
Gas Flow Computers ..... 899
Hughes' "Gas Works"..... 907



## DIVIDEND NOTICE.

OFFICE OF WELSBACH COMMERCIAL COMPANY,
40 WALL ST., NEW YORK CITY, Nov. 11, 1897.

The Directors have this day declared a quarterly dividend of two (2) per cent. on the preferred stock, payable Dec. 10, 1897, to stockholders of record at the close of business Nov. 30, 1897. Transfer books of the preferred stock will be closed from Dec. 1 to Dec. 10, 1897, both inclusive. Checks will be mailed

1172-3 EDWARD C. LEE, Treasurer.

## WANTED TO PURCHASE,

**A Gas Plant, or a Combined Gas and Electric Plant,**

which will permit of re-organization. About half a million dollars to invest. Address

1174-1 "CAPITAL," care this Journal.

## Wanted, to Purchase or Lease,

**A Gas Works in a Town of 5,000 to 10,000 Population, Near New York.**

Or would buy a controlling interest. Particulars will be treated confidentially. Address.

1172-3 "G. A. S.," care this Journal.

## Wanted, to Purchase or Lease,

**A Gas Plant in a Town of from 8,000 to 20,000 Inhabitants.**

The States of Illinois, Indiana, Ohio or Michigan preferred.

1173-4 Address "H. T.," care this Journal.

## GAS ENGINEER AND CHEMIST,

age 32, is open to take charge of a coal, oil, or water gas plant. Will travel for responsible firm. Has had experience in working inclined retorts. First-class references and testimonials. Address

1172-6 "G.E.C.," care this Journal.

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**As Superintendent of Gas Works.**

Has had 19 years' experience in the manufacture and distribution of water gas, in works with a capacity of 100,000 to 5,000,000 cubic feet per day. Best of references. Address
1169-7 "W. J. B.," care this Journal.

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**Modern Gas Plant in Growing Pennsylvania City.**

Capacity of works, 75,000 cubic feet per day; 11 miles of mains. Splendid bargain for the right party. Address
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**A Small Gas and Electric Light Plant,**

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**Hydraulic, Dip, Branch and Ascension Pipes, Mouthpieces and Lids,** for four Benches of 5's and for one Bench of 3 retorts.

**Two Coolers, or Air Condensers,** each of 150'000 cubic feet capacity.

**Multitubular Condenser,** shell, 36 in. diameter, with 98 2-in. tubes, 10 ft. 6 in. long.

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**Scrubber,** 48 in. diameter, 11 ft. 9 in. high. Three man holes, 11 in. by 15 in.

**S-inch Center Seal. Four Purifiers,** 8 ft. x 6 ft.

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(Established 1870.)

SOLE MANUFACTURER OF THE

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**Maxim & Clough Adjustable Gas Burners**
Reg. Reg.

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**Utilize Your Gas Liquor.**
NO EXTRA LABOR OR OPERATING EXPENSES.

**Ammonia Concentrator.**

Not Expensive. Write to
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**For Gas Purification.**

Acts immediately, and more efficiently than any other purifying agent now in use.

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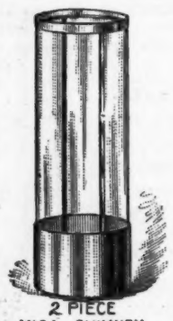

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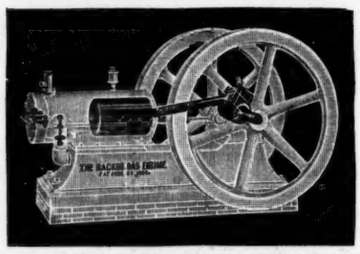
## BACKUS GAS ENGINES



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Furnished in Excellent Quality Cheaply.
**DR. PHILIPP HIRSCH,** Chemical Works, PANKOW-BERLIN.
NITRATE OF THORIUM, Chemically Pure, at the Cheapest Price. SAMPLES FREE IF DESIRED.

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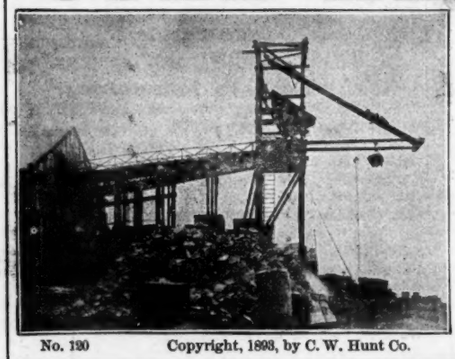

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The "Automatic" Railway shown in the engraving (in connection with tub elevator) is an elevated, self-acting railway, operated entirely by gravity, no steam, horse, or manual power being required in its operation. It runs with great rapidity, making a trip of 300 feet, dumping its load and returning to the starting point in about 35 seconds.

This Railway is specially adapted for handling large quantities of coal for Gas Works. Our Catalogue, No. 9306, on Coal Handling Machinery, gives full information on the subject. Before you forget it, send for a copy.

C. W. HUNT COMPANY,
**45 Broadway, - New York City.**

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EQUIPPED WITH
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**Single Boilers or Compact Batteries.**

GREAT SAVING OF FUEL AND FLOOR SPACE.
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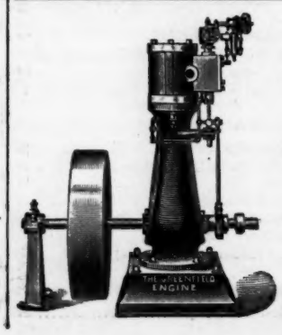

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Sizes from 3 to 75 Horse Power.
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AN IDEAL COKE FOR WATER GAS.

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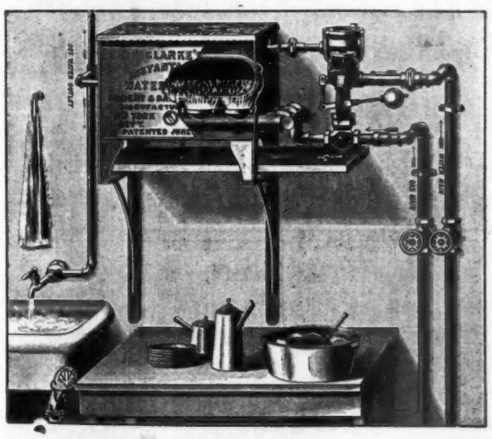

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This Heater furnishes water heated as it flows. The act of drawing water from any faucet with which it is connected automatically turns on the gas, which is in the same way instantly shut off when the flow of water is stopped at the faucet. It will deliver a gallon of water a minute as long as required, at a temperature 80° higher than it is delivered to the Heater; or it will deliver a less amount at a higher temperature, or a greater amount at a lower temperature, as may be determined by regulating the flow at a faucet. We have testimonial letters from those using it in Private Residences, Factories, Barber Shops, Restaurants, Stables, Laboratories, Stores, Churches, Commercial Buildings (for scrubbing), Banks, Clubs (baths, shower baths and sprays), Hotels, Riding Academies (baths and shower baths), and Patrol Stations

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EXCLUSIVELY

## THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

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Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

*Our System is in practical use in many cities, among which we may mention*

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| BALTIMORE. | CAMBRIDGE, " | EAST ORANGE, N. J. |
| ITHACA, N. Y. | BROOKLINE, " | NEW HAVEN, Conn. |
| COLLEGE POINT, N. Y. | FREEHOLD, N. J. | BEAVER, Pa. |

STYLE No. 97.

CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

# BRAY'S BURNERS

***Are Suitable for All Pressures and Conditions, and for Efficiency, Economy and Durability are Unrivaled.***

Producing a steady, well-shaped flame with burner cock turned on full. Prevent waste of gas, broken globes and dissatisfied consumers.

As Sole Agents in the United States for GEORGE BRAY & Co., we carry a full stock of all sizes for High and Low Pressures. Send for Prices and Special Pamphlet, or order a sample gross, stating your average house pressure.

Every Burner is stamped with name and trade mark. Cheap and inferior imitations are constantly coming in and going out of use, and we respectfully warn the trade against this kind of deception, as it causes loss and discredit to the trade and damage to the gas industry.

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**Gas Logs, Fires, Heaters,**

OF ALL KINDS.

GAS GOVERNORS,
GAS FURNACES,
and everything pertaining to the use of Gas.

**SEND FOR CATALOGUE.**

GAS RANGES,

**Broilers, Griddles, Ovens, Etc.**

**Gas Kilns for China.**

**Special Line of Gas Appliances for Hotels.**

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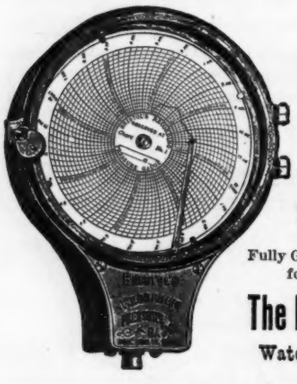

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**PRESSURE GAUGE.**

For continuous records of **Street Gas Pressure**

Simple in Construction, Accurate in Operation Low in Price.

Fully Guaranteed. Send for Circulars.

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**CHURCH'S TRAYS a Specialty.**

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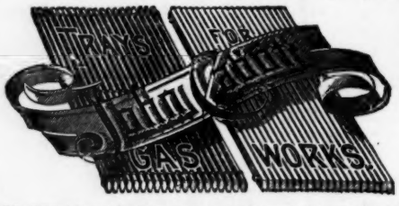


**553-557 West Thirty-third Street, New York.**

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

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**Patent Lava Gas Tips.**

**UNIFORMITY GUARANTEED.**

ALL SIZES AND SHAPES.

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ON THE CONSTRUCTION AND WORKING OF

**Regenerator Furnaces,**

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**Price, $1.25.**

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WILDER'S VOLUMETRIC GOVERNORS.

They control the pressure at the burner, and deliver the quantity for which they are set regardless of high or low pressure in the supply.

**WELSBACH LIGHTS** are fully controlled, and the governors soon pay for themselves by preventing the breaking of mantles and chimneys. Thousands are already in use. Orders may be given to the Welsbach Co., or sent to ourselves.

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Having compiled a novel Chart or Map illustrating the various

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***Order Recently Received—16 Machines, each for 3,500,000 Cubic Feet per day.***

The Patentees of the above, after several years' experience, finding that the enormous weight of the iron sheets (forming the washing discs) caused undue wear of the shafts and consequent fractures of the latter, introduced their Patent Wooden "Grid Segments." These "segments" have now been fitted in some hundreds of Patent "Standard" Washer-Scrubbers, and are universally admitted to be a great improvement upon the out of date pattern.

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## GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers. Oil Tanks, Smoke Stacks.

**STEEL ROOFS and BUILDINGS.**

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

**THE ANDERSON Patent Cutter Carrying Link**
Made in all sizes.

Will cut from 2 in. to 24 in.
**Pipe Cutting Tool**

For Cutting Cast, Wrought Iron, Gas & Water Pipes.
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BLOCKS, TILES, FIREBRICKS, FIRE CEMENT,
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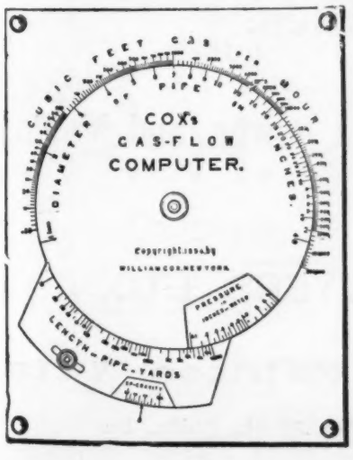


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2. When the required discharge and the length of pipe are given, the diameter corresponding to any pressure is at once seen.
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4. Any suitable combination of the different factors of any problem, under all possible conditions, may be immediately found.

**It Prevents Errors and Saves Hours of Tiresome Calculations.**

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Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

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MORE DIRECT IN ACTION. FEWER PARTS.
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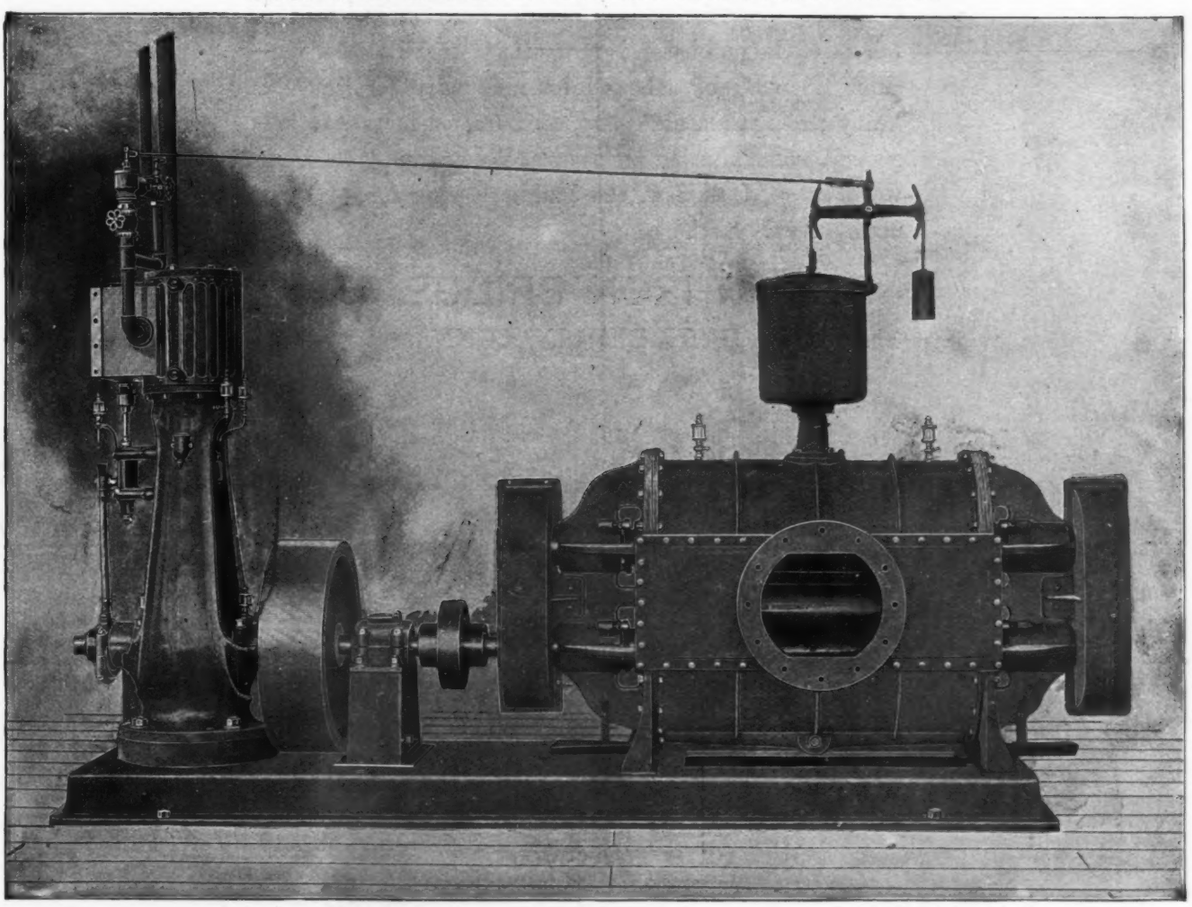

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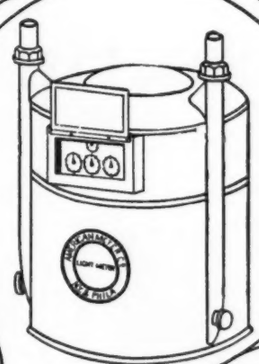
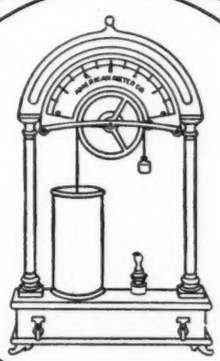
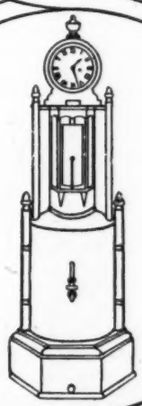
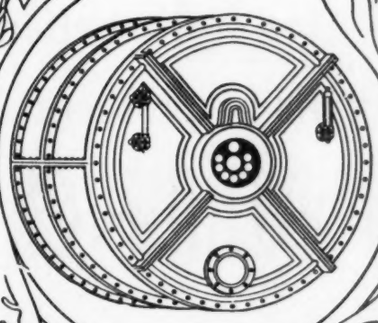
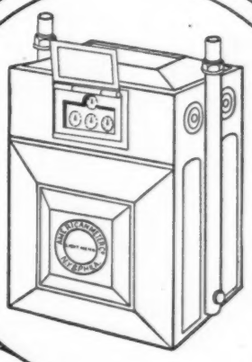
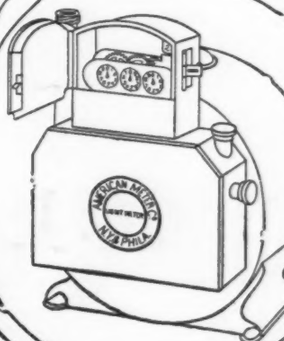












## PUBLIC LIGHTING TABLE.

### DECEMBER, 1897.

| Day of Week. | Date. | Table No. 1. FOLLOWING THE MOON. Light. | Extinguish. | Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light. | Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Wed. | 1 | 11.50 PM | 6.00 AM | 4.20 | 6.10 |
| Thu. | 2 | 12.50 AM | 6.00 | 4.20 | 6.10 |
| Fri. | 3 | 1.50 | 6.00 | 4.20 | 6.15 |
| Sat. | 4 | 2.50 | 6.00 | 4.20 | 6.15 |
| Sun. | 5 | 3.50 | 6.10 | 4.20 | 6.15 |
| Mon. | 6 | 4.50 | 6.10 | 4.20 | 6.15 |
| Tue. | 7 | No L. | No L. | 4.20 | 6.15 |
| Wed. | 8 | No L. FM | No L. | 4.20 | 6.15 |
| Thu. | 9 | No L. | No L. | 4.20 | 6.15 |
| Fri. | 10 | 5.00 PM | 6.40 PM | 4.20 | 6.20 |
| Sat. | 11 | 5.00 | 7.40 | 4.20 | 6.20 |
| Sun. | 12 | 5.10 | 8.50 | 4.20 | 6.20 |
| Mon. | 13 | 5.10 | 9.50 | 4.20 | 6.20 |
| Tue. | 14 | 5.10 | 10.50 | 4.20 | 6.20 |
| Wed. | 15 | 5.10 | 12.00 AM | 4.20 | 6.20 |
| Thu. | 16 | 5.10 LQ | 1.00 | 4.20 | 6.20 |
| Fri. | 17 | 5.10 | 2.10 | 4.20 | 6.20 |
| Sat. | 18 | 5.10 | 3.20 | 4.20 | 6.20 |
| Sun. | 19 | 5.10 | 4.40 | 4.20 | 6.20 |
| Mon. | 20 | 5.10 | 6.20 | 4.20 | 6.20 |
| Tue. | 21 | 5.10 | 6.20 | 4.20 | 6.20 |
| Wed. | 22 | 5.10 | 6.20 | 4.20 | 6.20 |
| Thu. | 23 | 5.10 NM | 6.20 | 4.20 | 6.20 |
| Fri. | 24 | 5.10 | 6.20 | 4.20 | 6.25 |
| Sat. | 25 | 5.10 | 6.20 | 4.20 | 6.25 |
| Sun. | 26 | 5.10 | 6.20 | 4.20 | 6.25 |
| Mon. | 27 | 5.10 | 6.20 | 4.20 | 6.25 |
| Tue. | 28 | 9.30 | 6.20 | 4.20 | 6.25 |
| Wed. | 29 | 10.40 | 6.20 | 4.20 | 6.25 |
| Thu. | 30 | 11.40 FQ | 6.20 | 4.20 | 6.25 |
| Fri. | 31 | 12.40 AM | 6.20 | 4.20 | 6.25 |

### TOTAL HOURS LIGHTING DURING 1897.

| By Table No. 1. | Hrs.Min. | By Table No. 2. | Hrs.Min. |
|---|---|---|---|
| January | 233.00 | January | 423.20 |
| February | 187.20 | February | 355.25 |
| March | 202.00 | March | 355.35 |
| April | 170.40 | April | 298.50 |
| May | 163.00 | May | 264.50 |
| June | 140.40 | June | 234.25 |
| July | 151.40 | July | 243.45 |
| August | 167.30 | August | 280.25 |
| September | 174.40 | September | 321.15 |
| October | 200.00 | October | 374.30 |
| November | 205.20 | November | 401.40 |
| December | 220.10 | December | 433.45 |
| Total, yr. | 2216.00 | Total, yr. | 3987.45 |

# To Whom It May Concern.

WE have learned that the makers of the "Sunlight" lamp assert that there has been a decision in the English Courts which saves them and their customers from liability as infringers of the Welsbach patents.

We assure the public there is no decision of any Court, in England or elsewhere, that directly or indirectly warrants the statement or inference that the lamp sold by the Sunlight Incandescent Gas Lamp Company of America is not an infringement of the Welsbach Light as made under the American patents, of which the Welsbach Light Company is sole and exclusive owner.

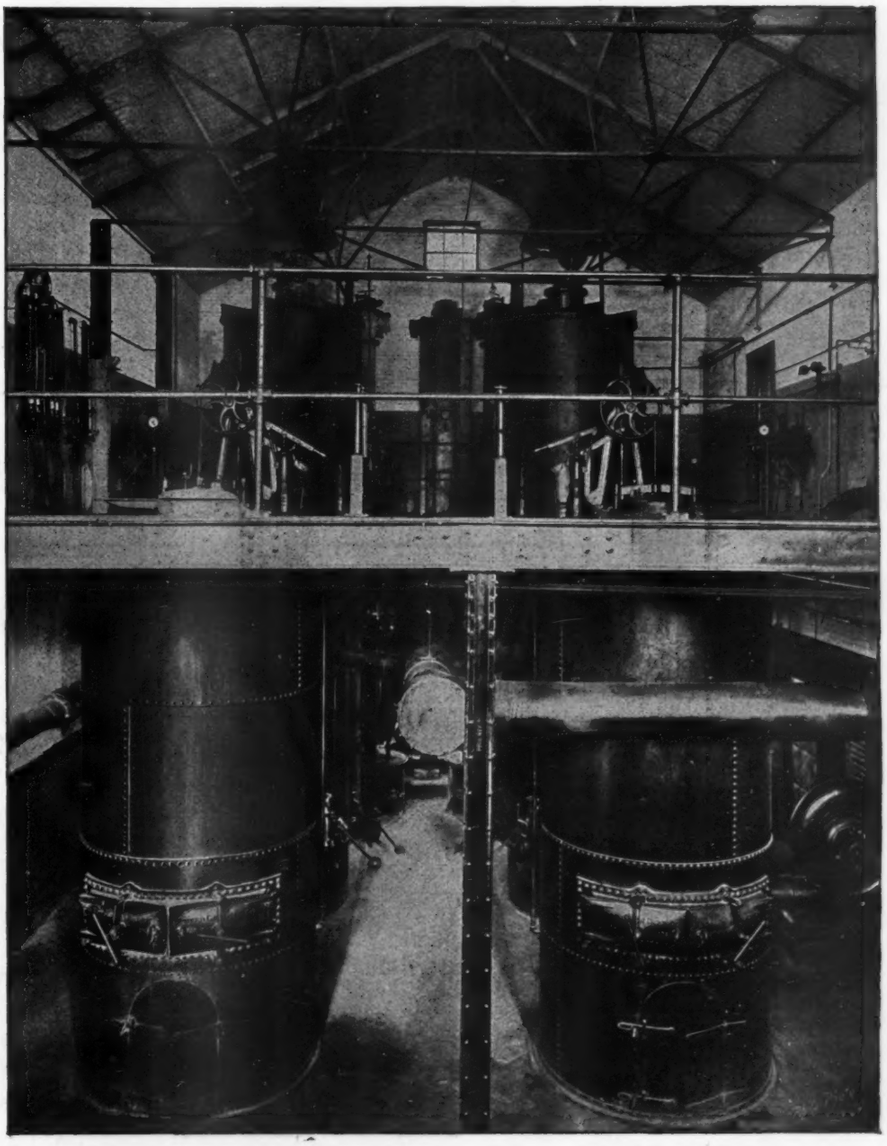
NOTICE is hereby given to all PURCHASERS and USERS of the so-called "Sunlight" lamp that suits will be brought against them for DAMAGES for INFRINGEMENT of the Letters Patent of the Welsbach Light Company, and will be prosecuted vigorously.

**WELSBACH LIGHT COMPANY.**

# Standard Double-Superheater Lowe Water Gas Apparatus.

**Number of Installations to Date, - - 238**

**Total Daily Capacity, 127,700,000 Cu. Ft.**



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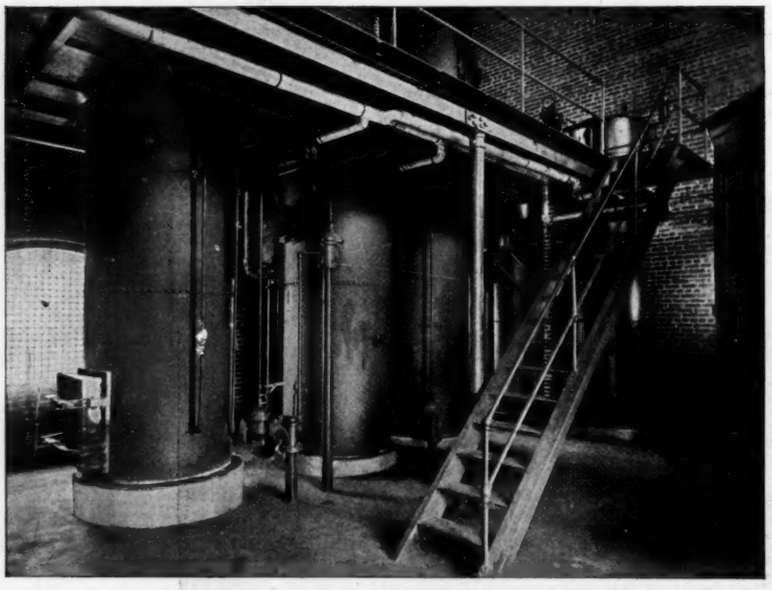
DREXEL BUILDING, PHILA., PA.

# A Model Little Works in California.



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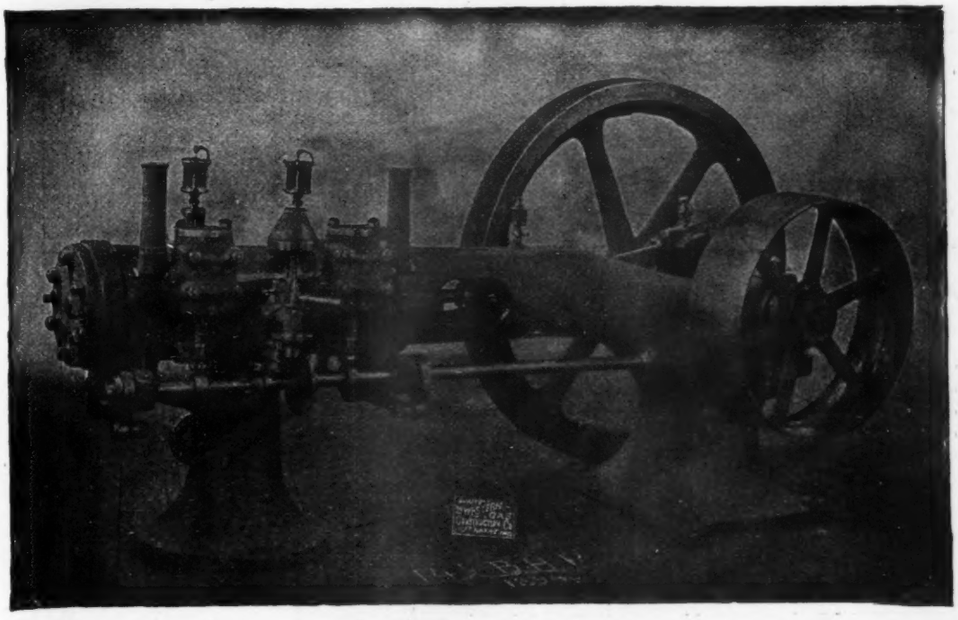

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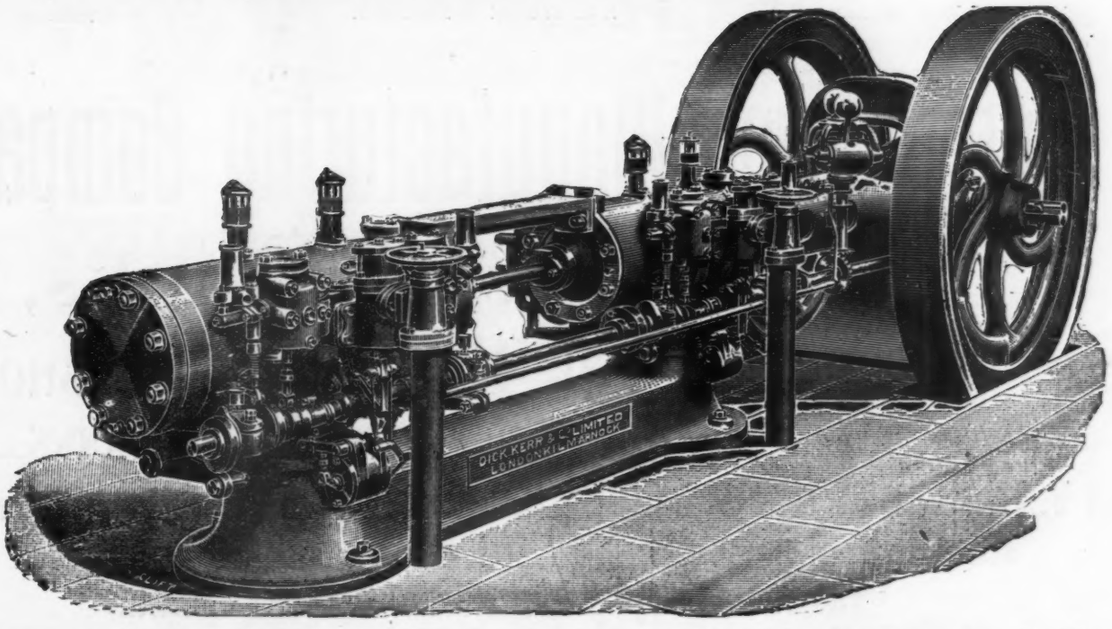


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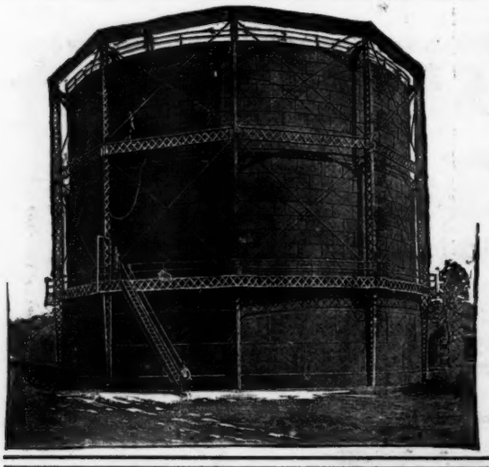

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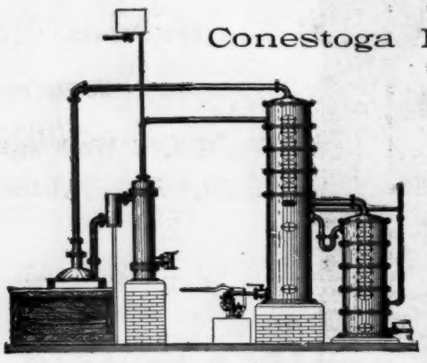

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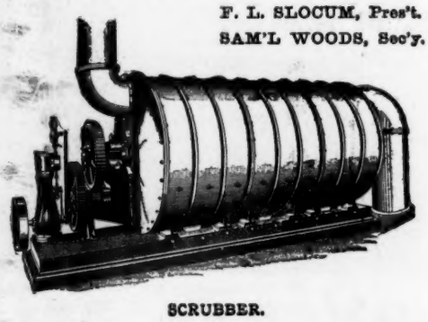

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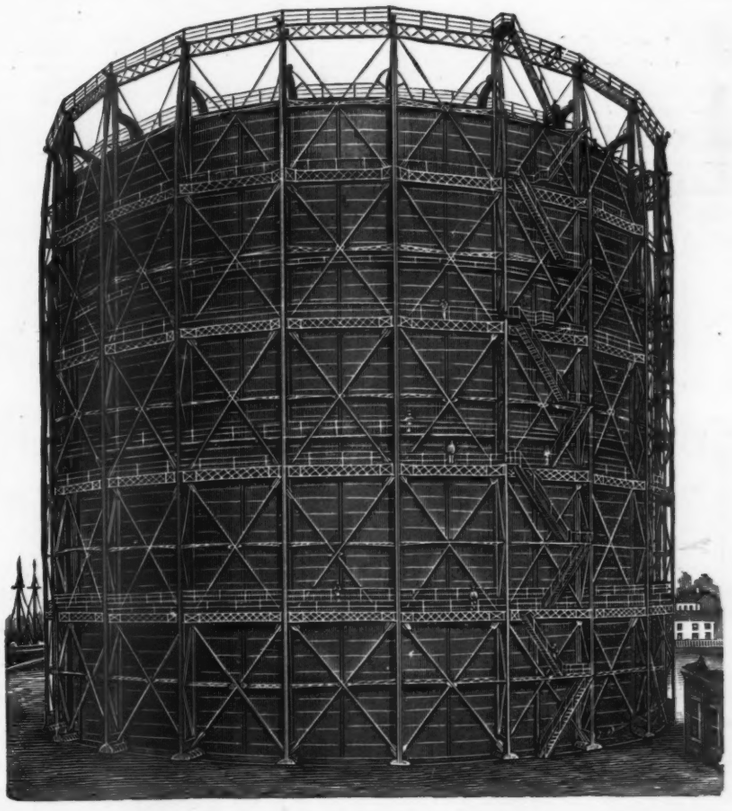

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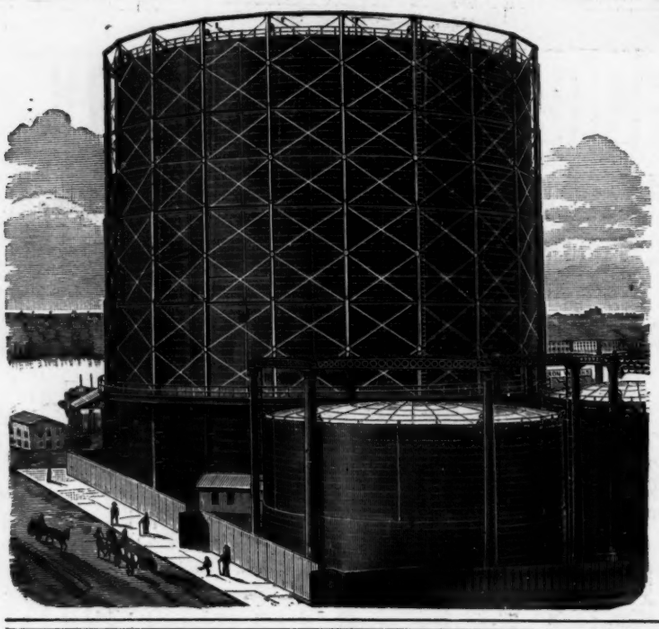

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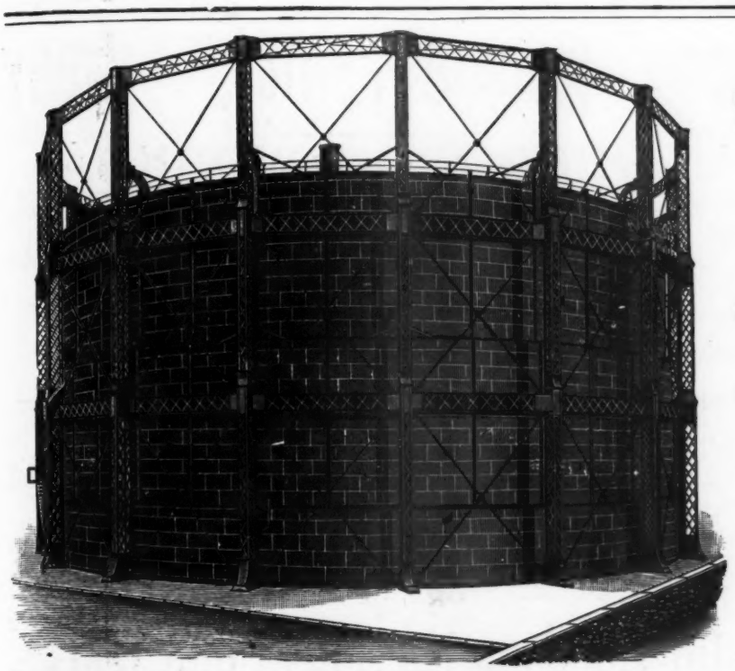

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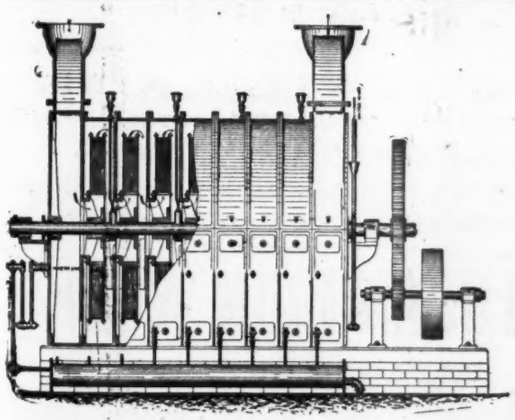

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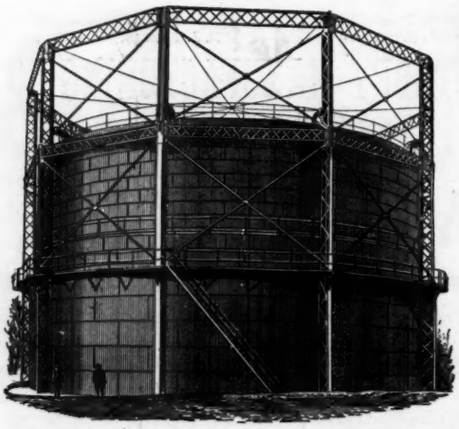

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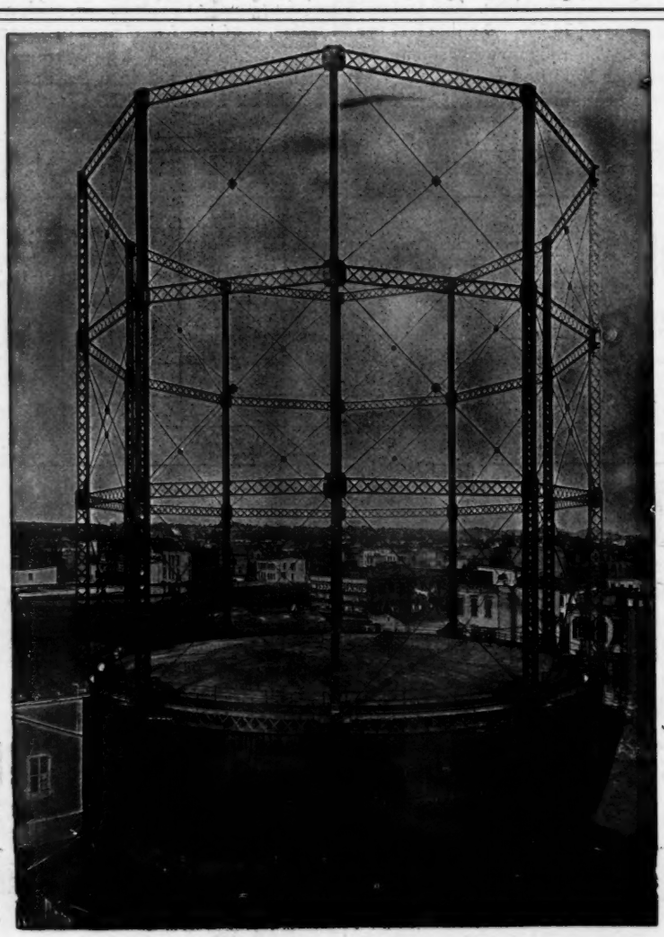

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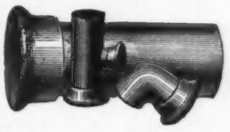

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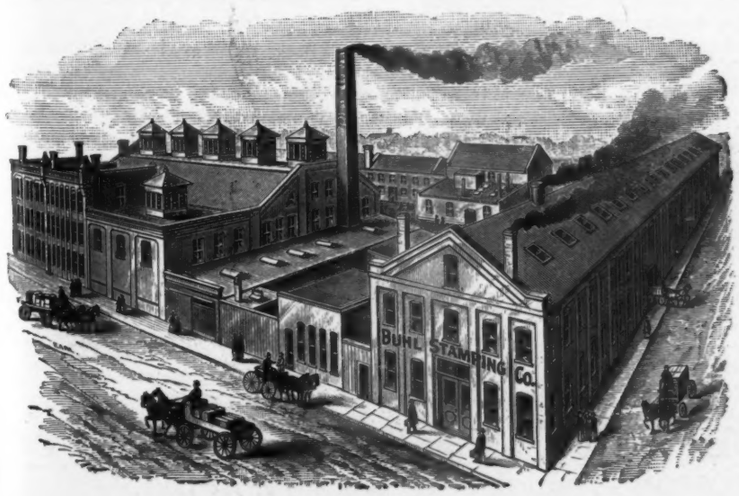


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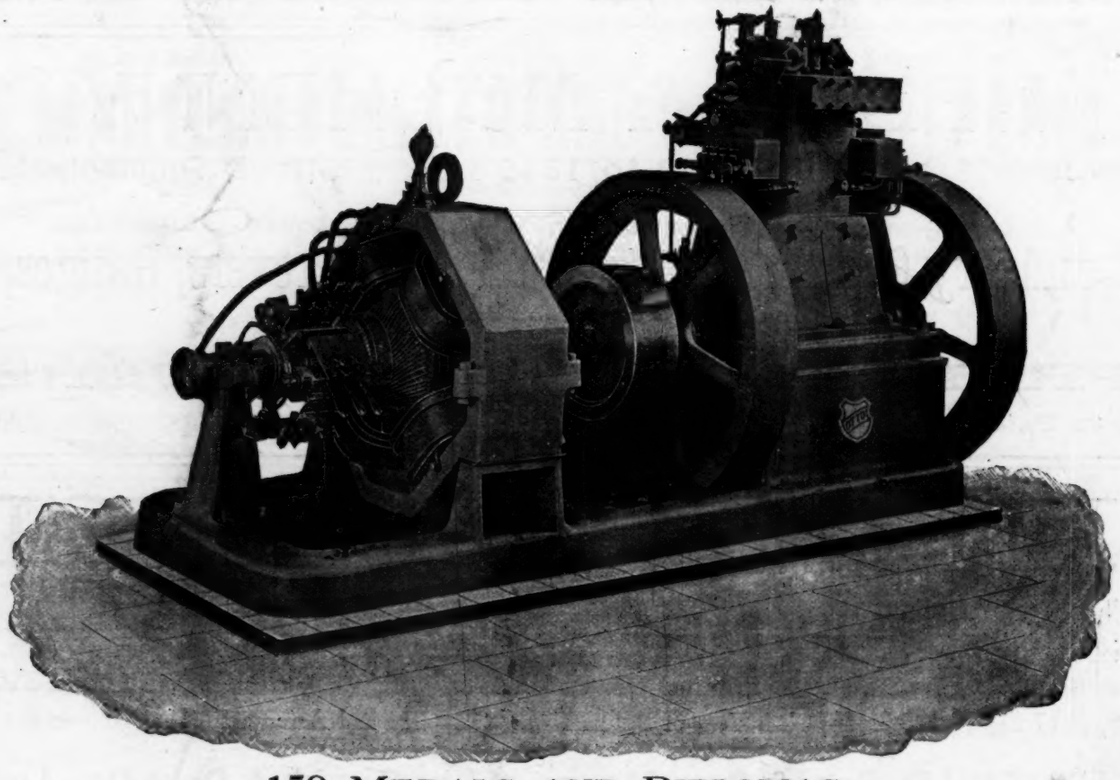

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